Development of a New Location Referencing System (LRS) based on GPS

A WSDOT Collaborative Effort

Why develop a new LRS???

- Accurate location of National Highway System (NHS) routes including the Strategic Highway Network (STAHNET- federal defense access highways) is vital in planning emergency response routing.
- A Location Referencing System based on GPS data will help WSDOT improve the locational accuracy of its highways and will support the requirements of Project Designers, Construction Offices, Safety and Performance Analysts, and compliance with GASB34 and Asset Management.

Team Responsibilities

The **Transportation Data Office** is collecting and post processing GPS coordinate data.

Geographic Services will use the GPS coordinate data to develop a new GIS basemap to a degree of accuracy within +/- 3 to 5 feet.

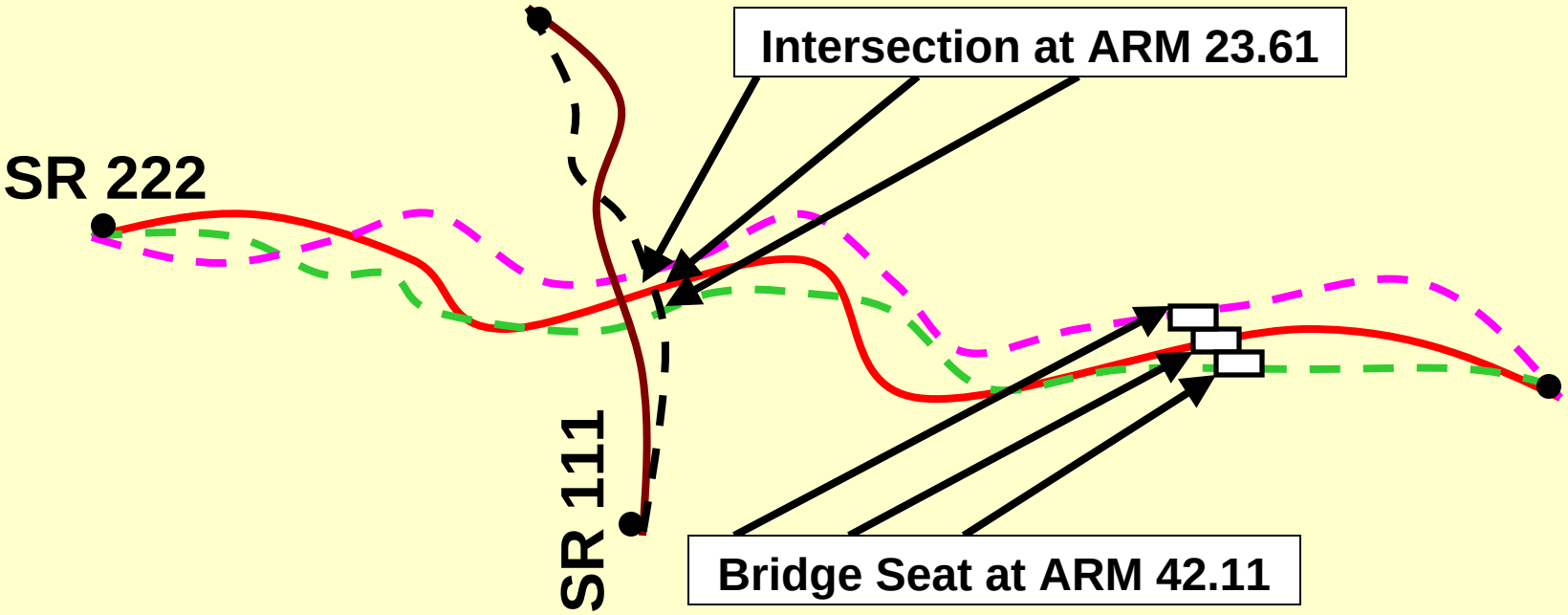
The **Transportation Data Office** will develop a new, more accurate State Route Log.

Background Information

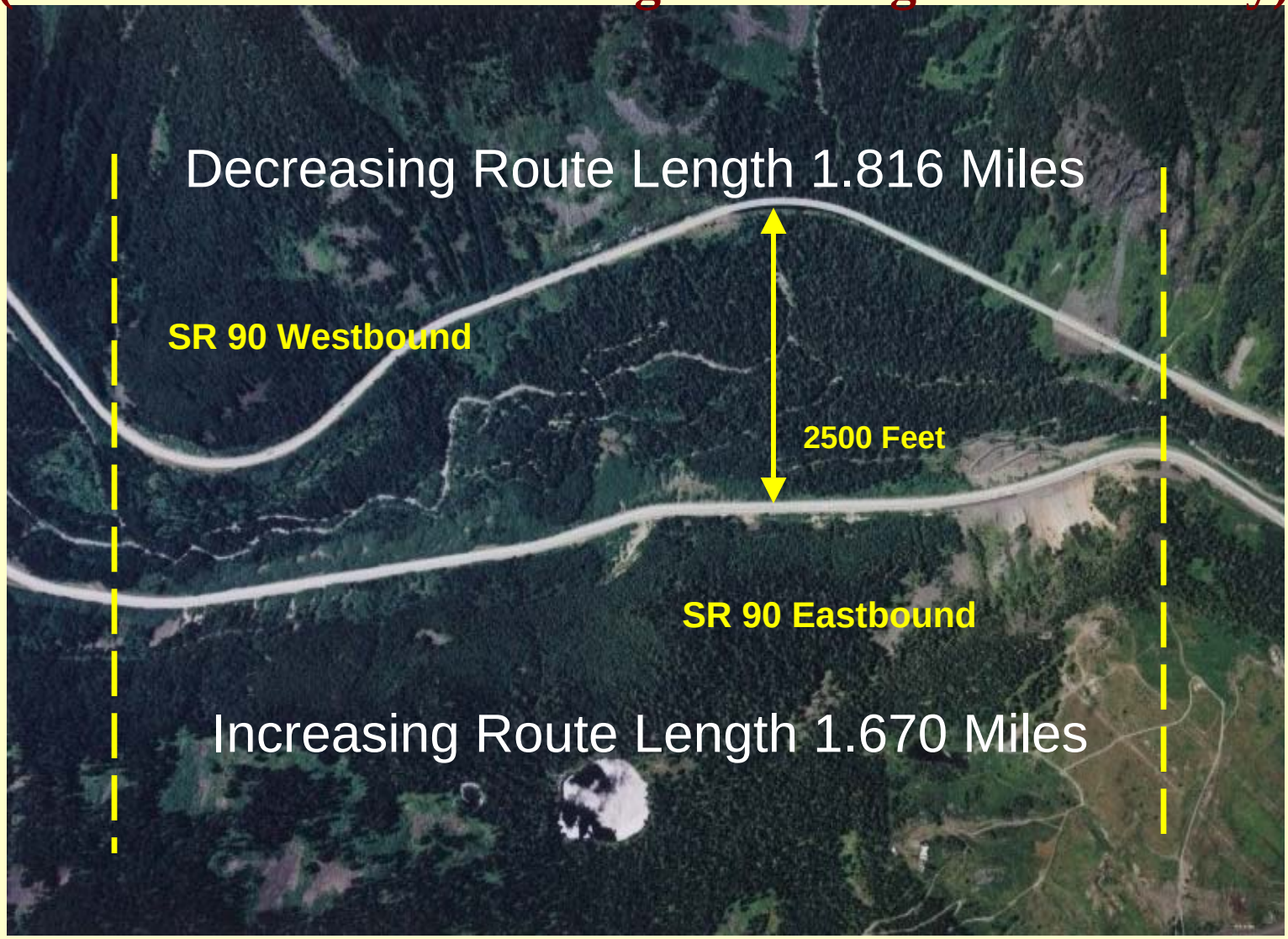
The existing Linear Referencing System (DMI/LRS) simply does not meet the Department's changing business requirements:

- **Data collected by state of the art technology cannot be accurately represented**
- **State Routes are inventoried on the increasing milepost direction using a Distance Measuring Instrument (DMI)**

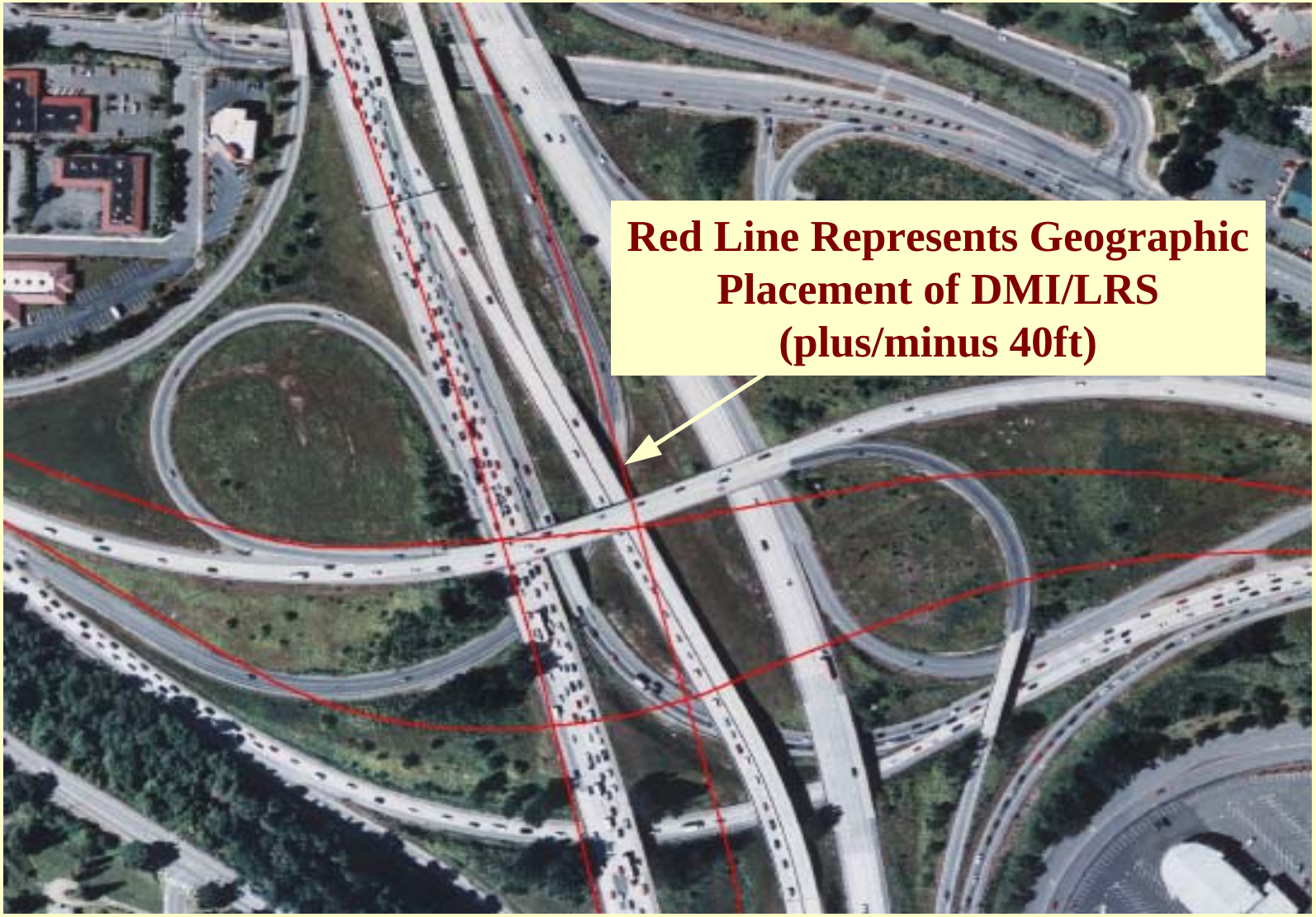
Traditional DMI/LRS



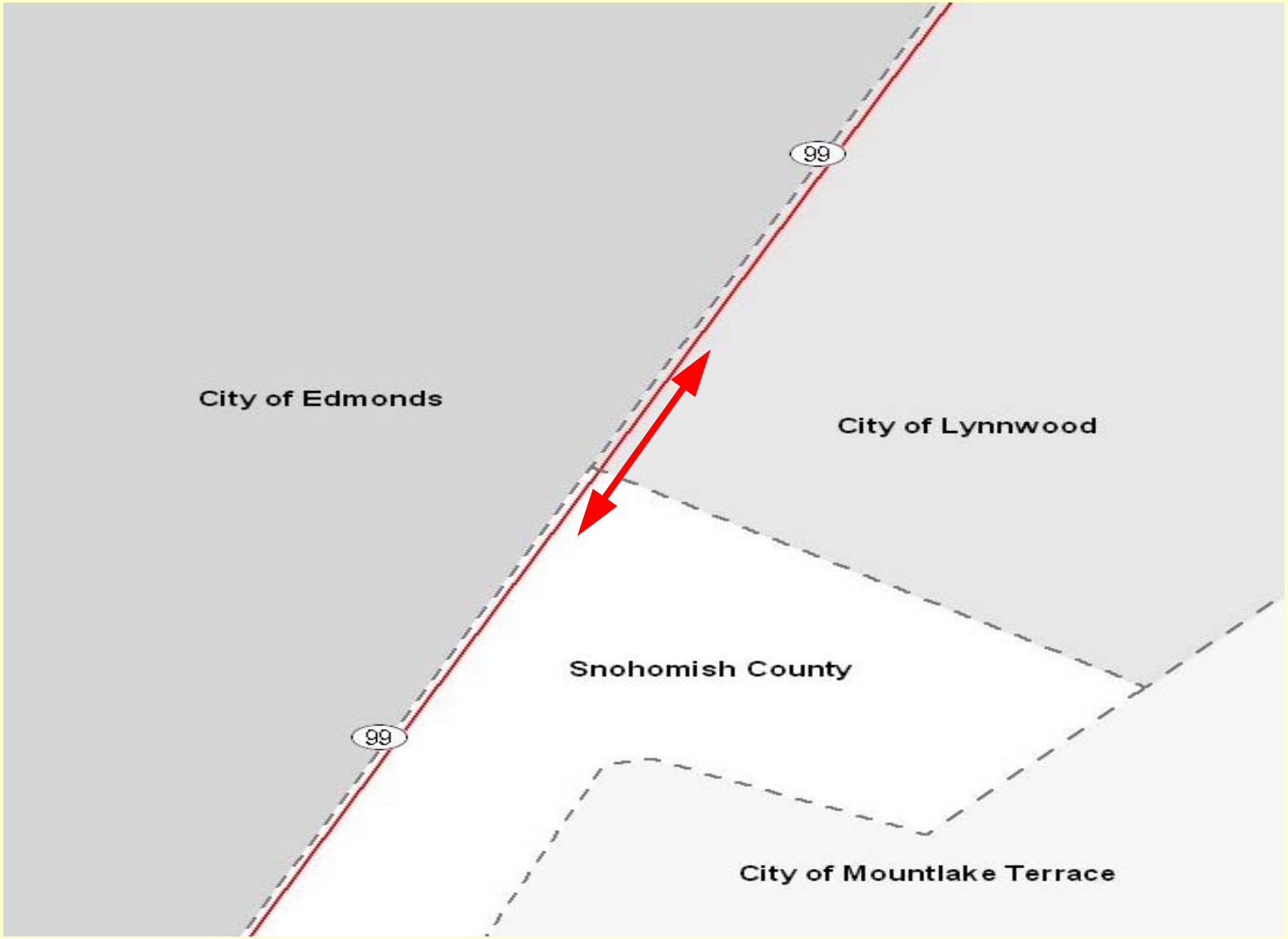
Existing DMI/LRS
(Routes Are Measured Using Increasing Direction Only)



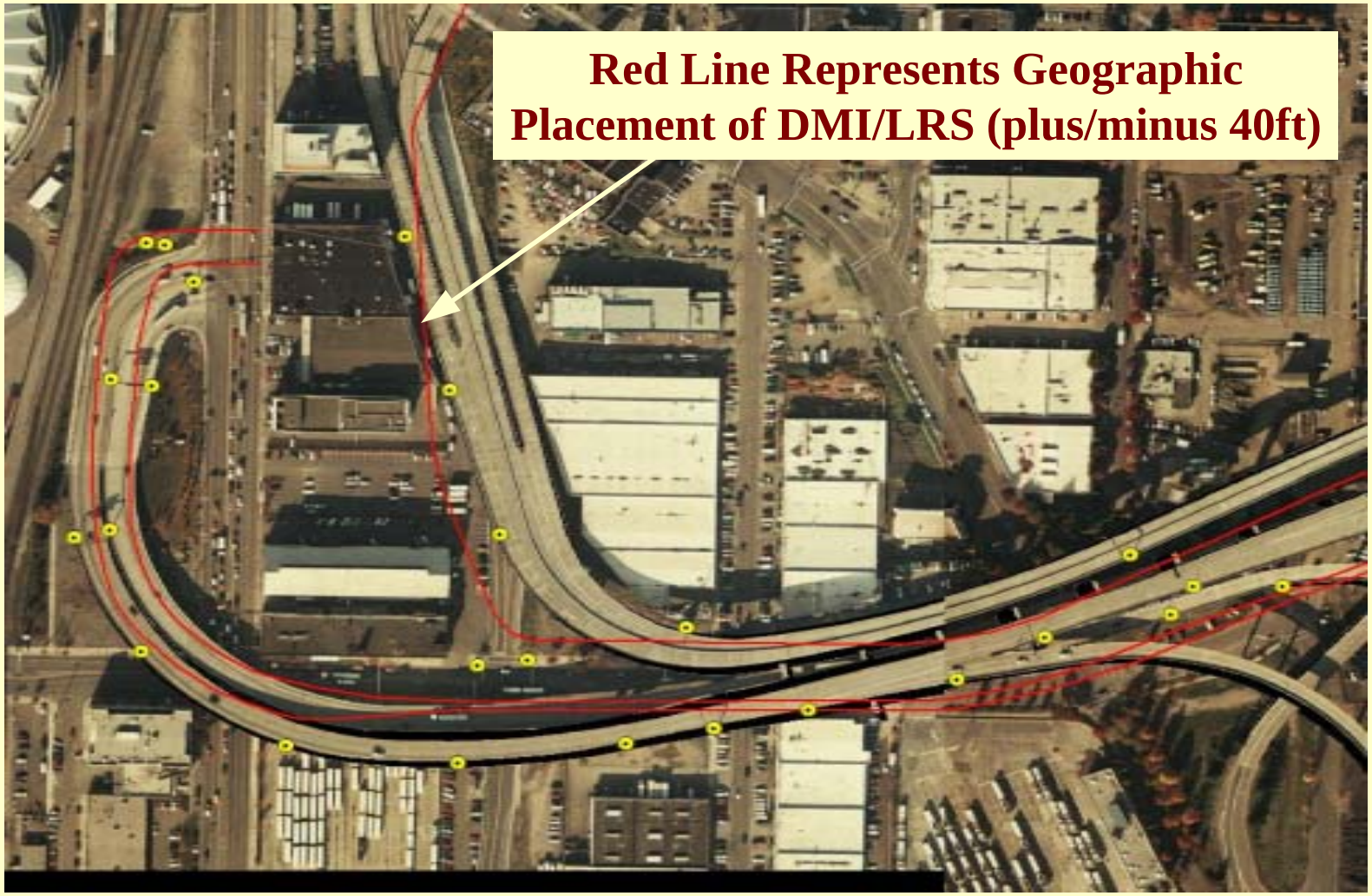
Existing
(DMI/LRS)



Existing
(DMI/LRS)

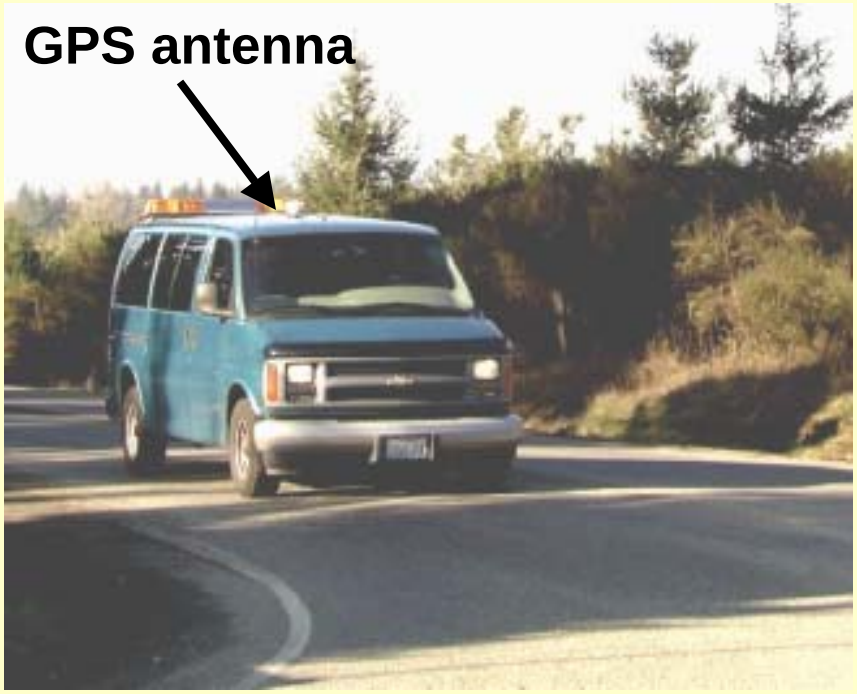


Existing
(DMI/LRS)

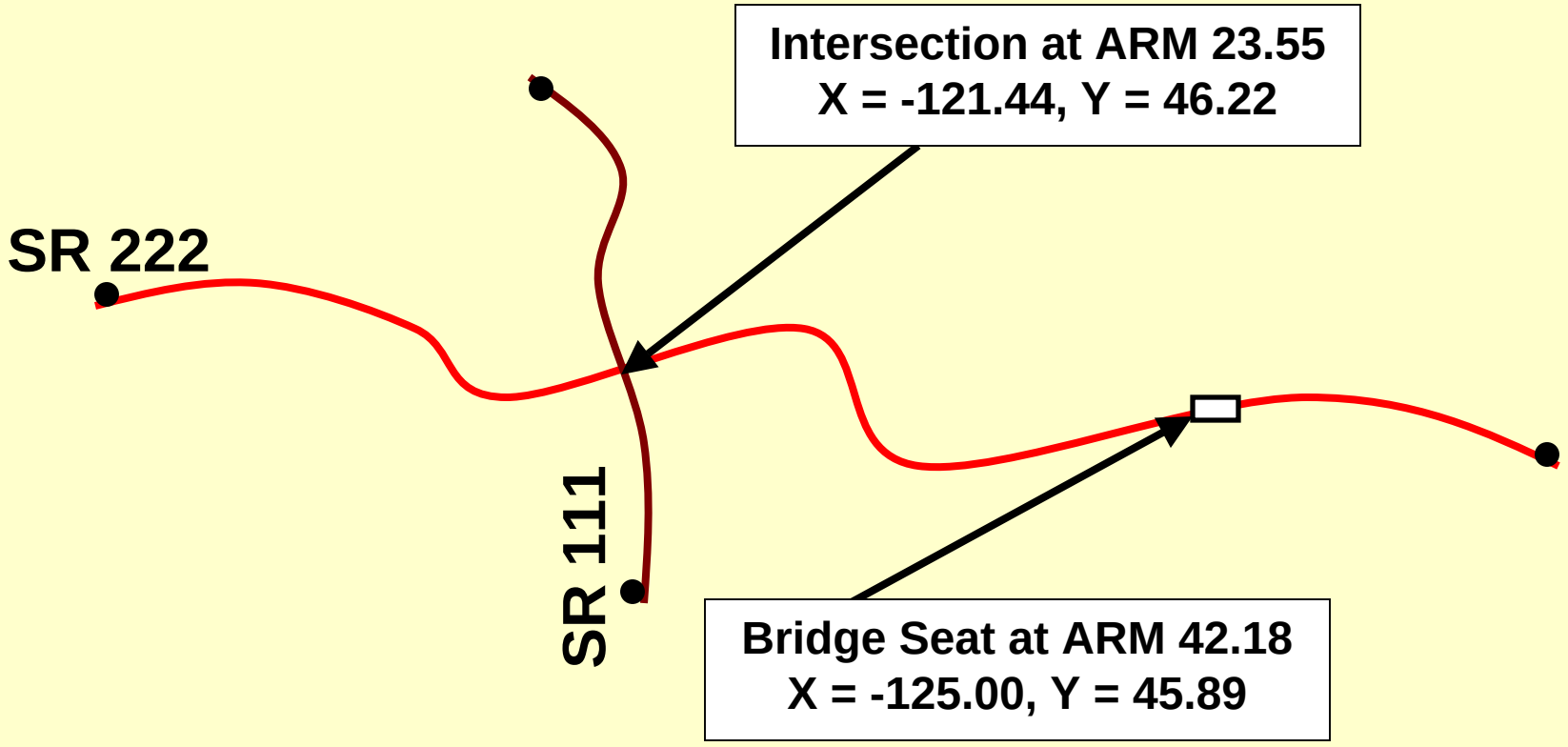


GPS Data Collection

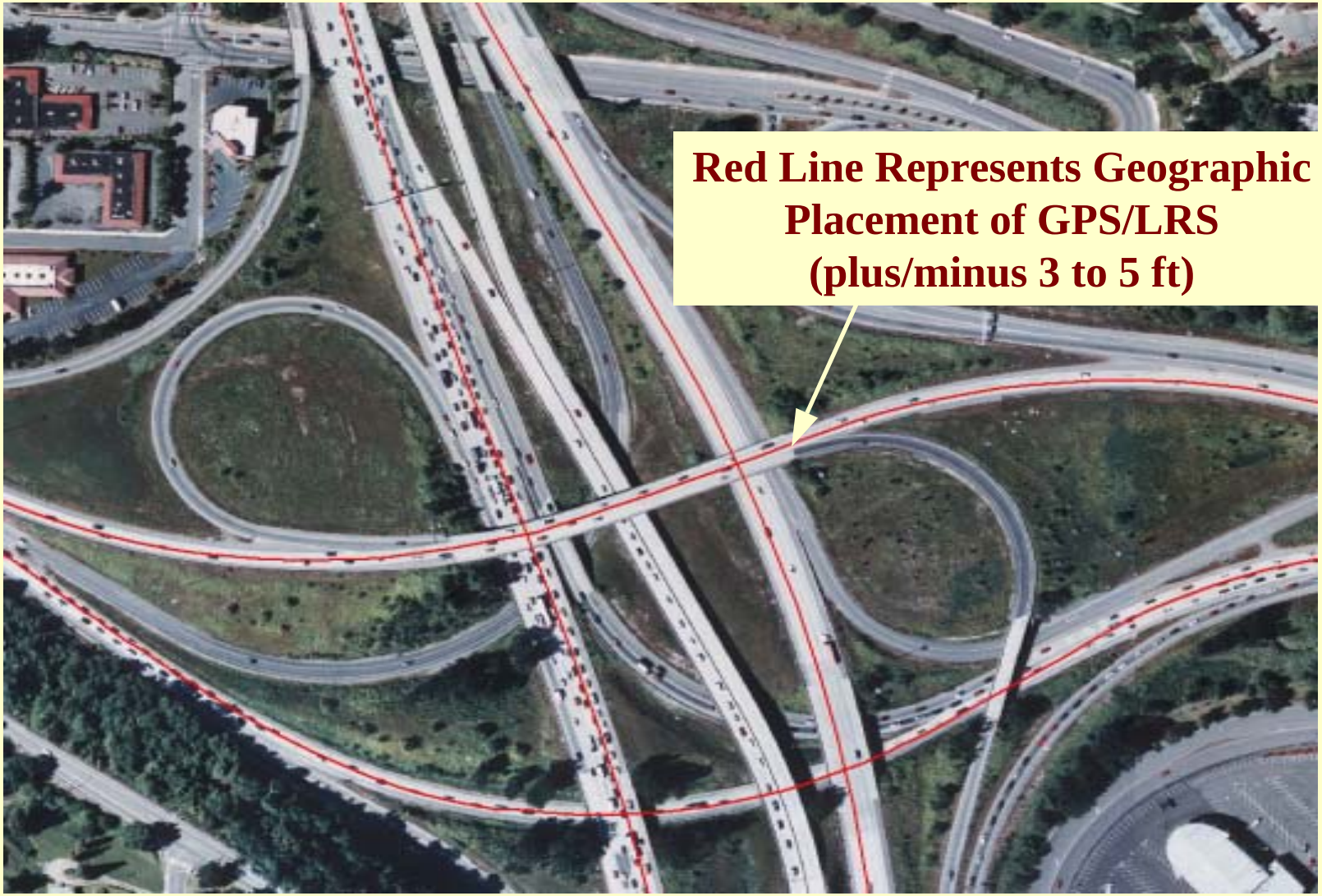
- TDO is collecting GPS points while driving along State Routes.
- Latitude, longitude and elevation (X,Y,Z) coordinates, when post-processed and edited, will allow a real-world geospatial location of the route alignment.



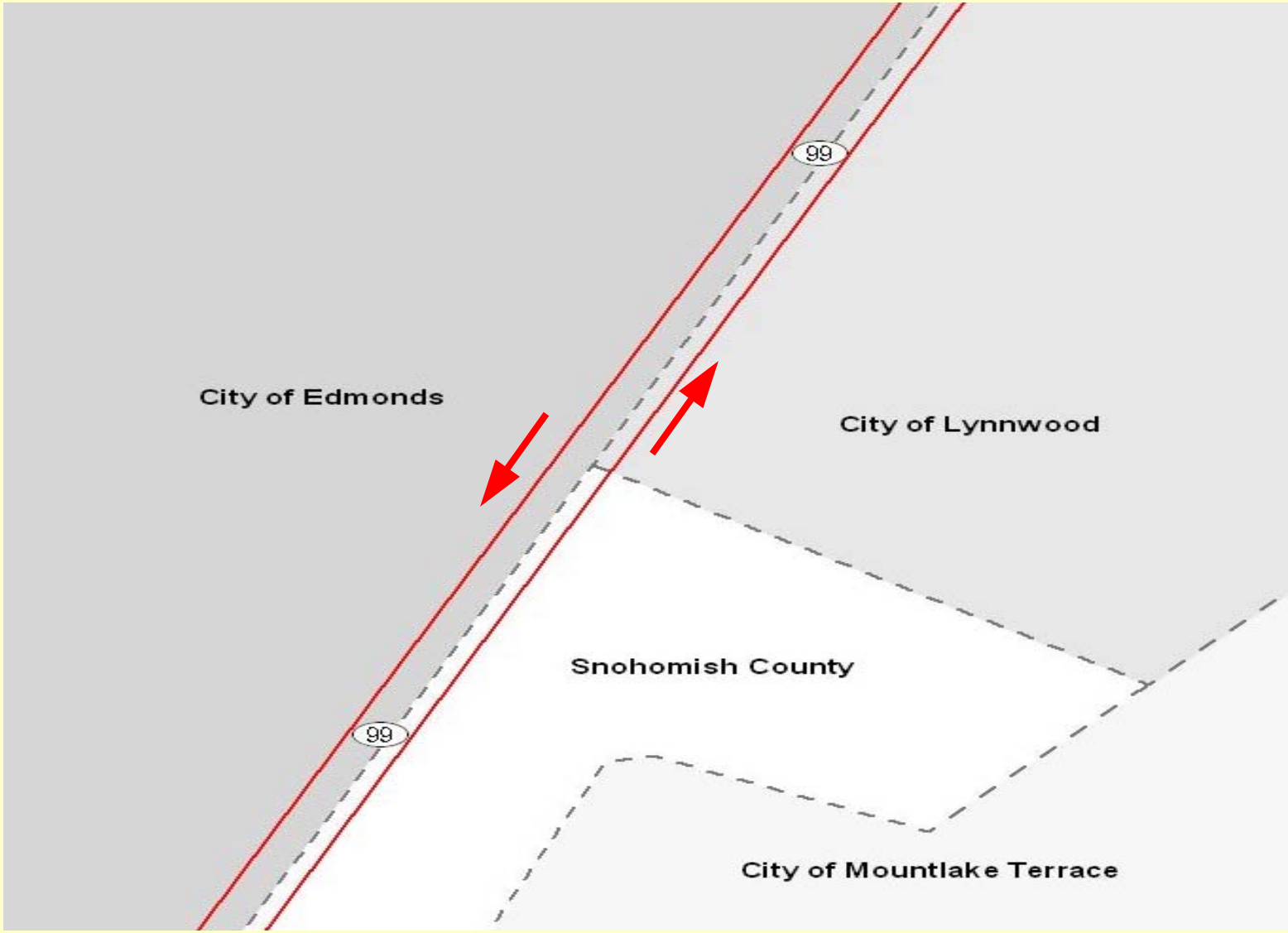
The New GPS LRS will be a location referencing system



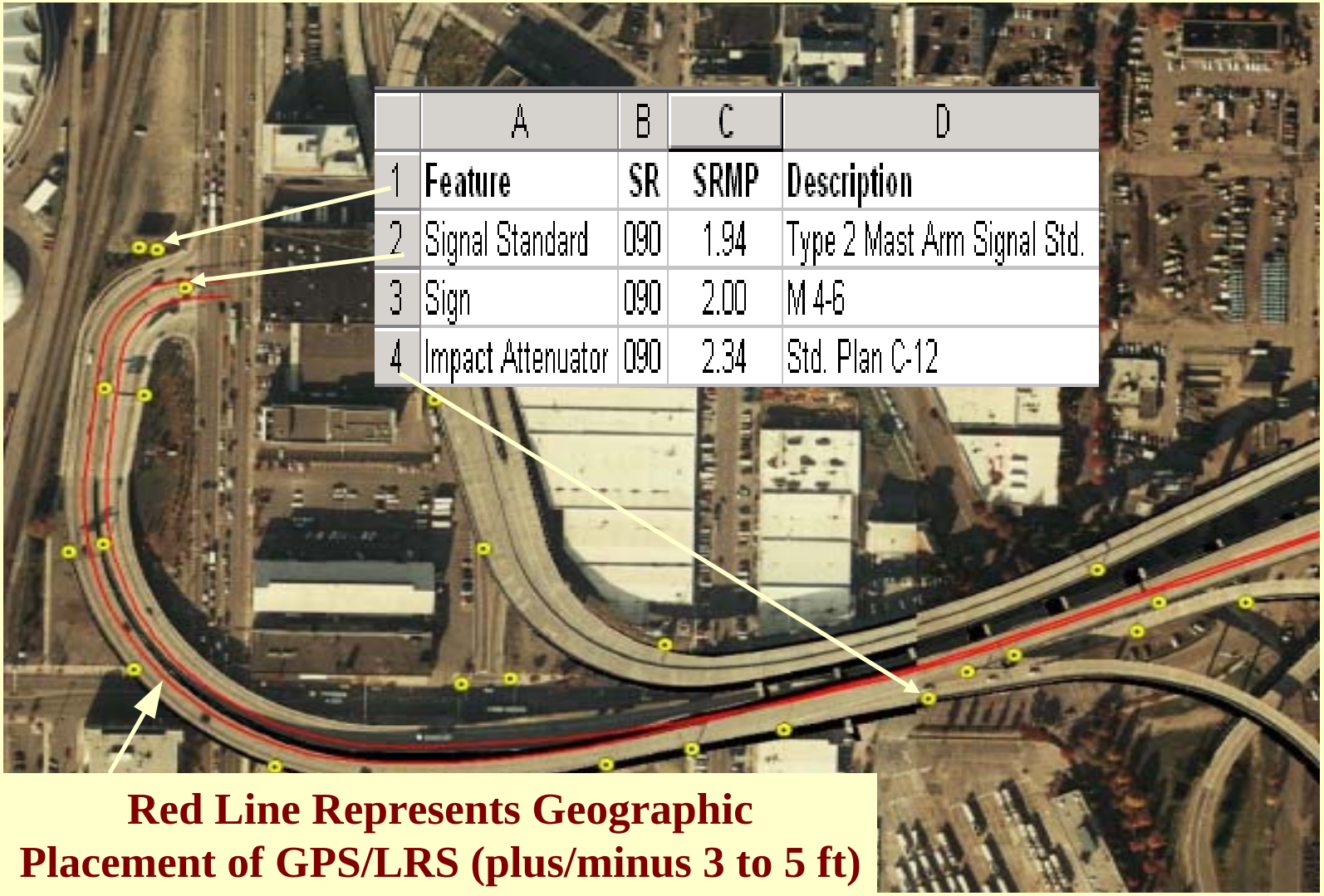
Future
(GPS/LRS)



Future
(GPS/LRS)



Future
(GPS/LRS)



	A	B	C	D
1	Feature	SR	SRMP	Description
2	Signal Standard	090	1.94	Type 2 Mast Arm Signal Std.
3	Sign	090	2.00	M 4-6
4	Impact Attenuator	090	2.34	Std. Plan C-12

Red Line Represents Geographic Placement of GPS/LRS (plus/minus 3 to 5 ft)

Benefits of GPS LRS

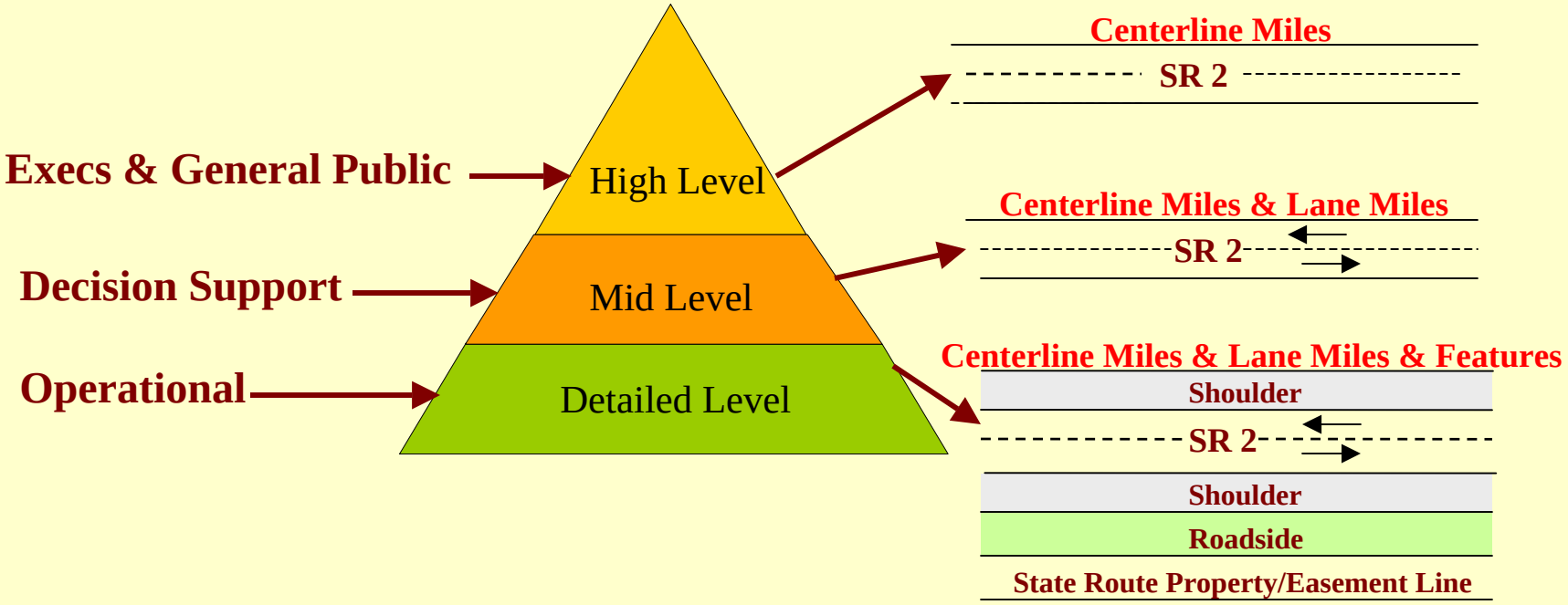
- Any feature tracked for the State Highway system (maintenance inventory, bridges, wetlands, etc.) can now be positioned on the new LRS.
- GPS points collected by TDO are delivered to Geographic Services to improve WSDOT GIS applications.
- Individuals who collect any feature data using GPS can now link their data to the new LRS.

Conceptual Methodology for Identification of State Route Components

Purpose Statement:

Define a methodology & model that depicts the basic components of our State Route System and incorporates GPS accuracy for objects and events.

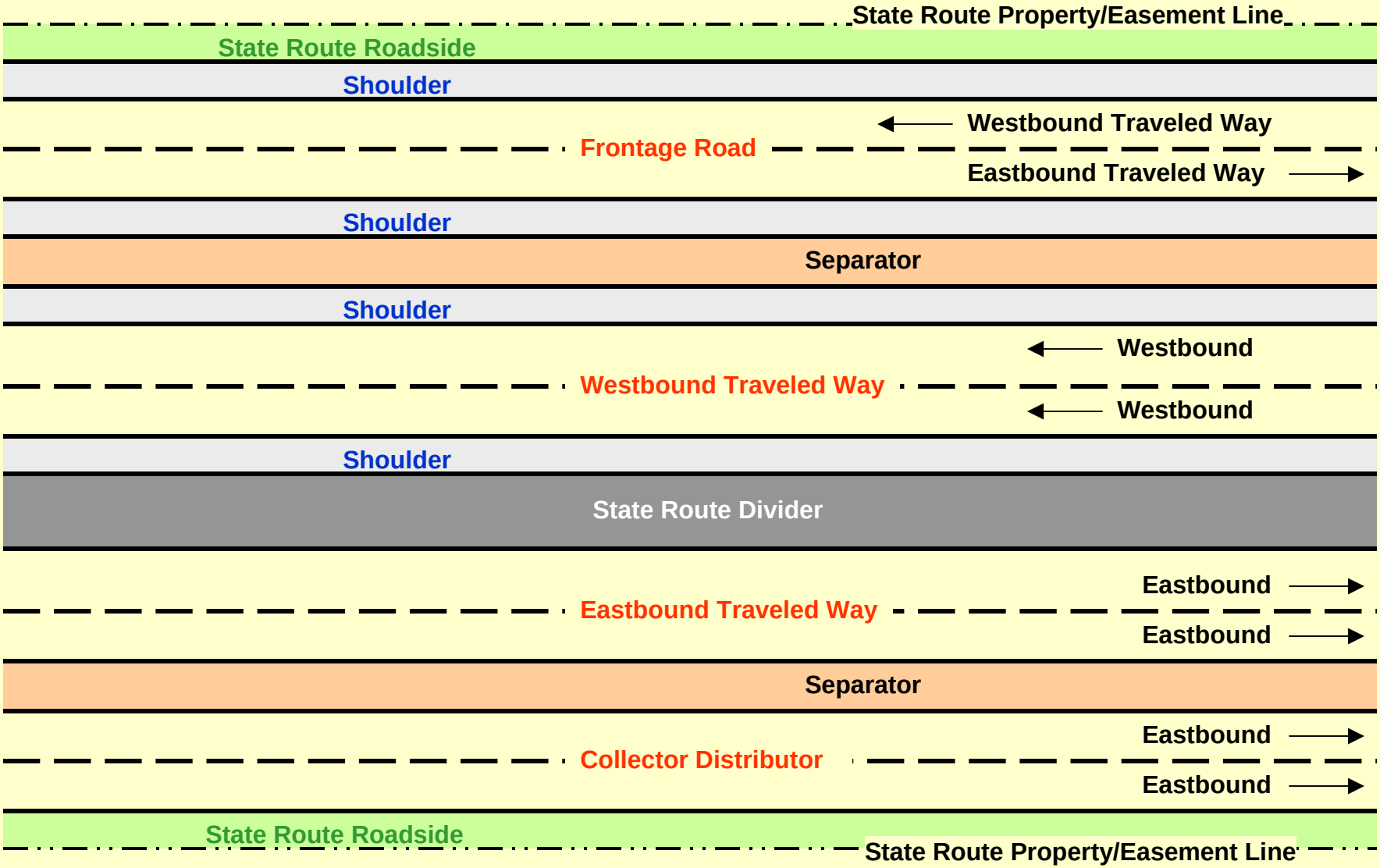
Location Referencing System (GPS/LRS)
Level of Detail



ADAPTING EXISTING STANDARDS TO MEET BUSINESS NEEDS

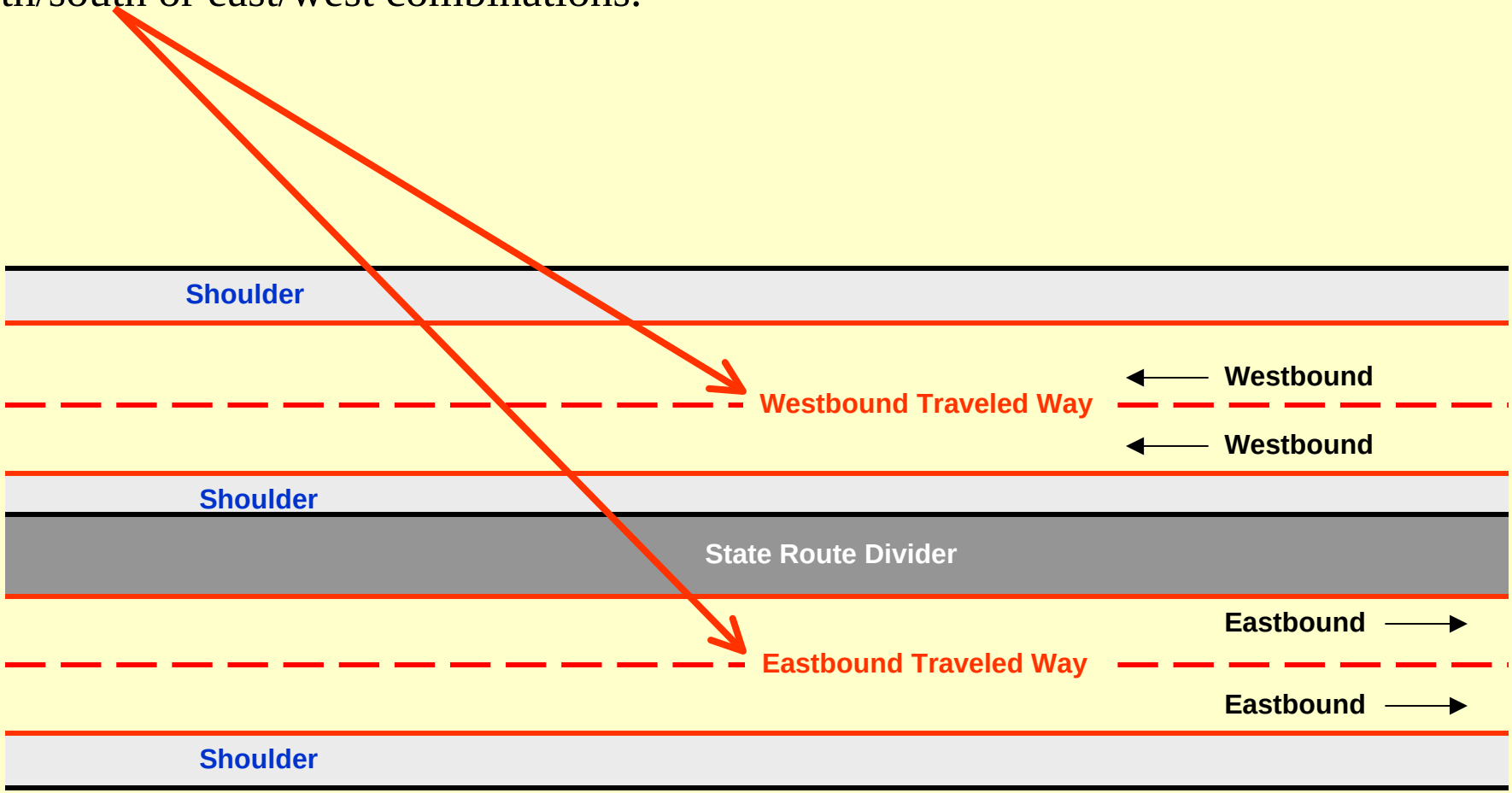
Definitions

STATE ROUTE: A trafficway under WSDOT jurisdiction for public use as a matter of right or custom for the purpose of moving persons or property from one place to another.



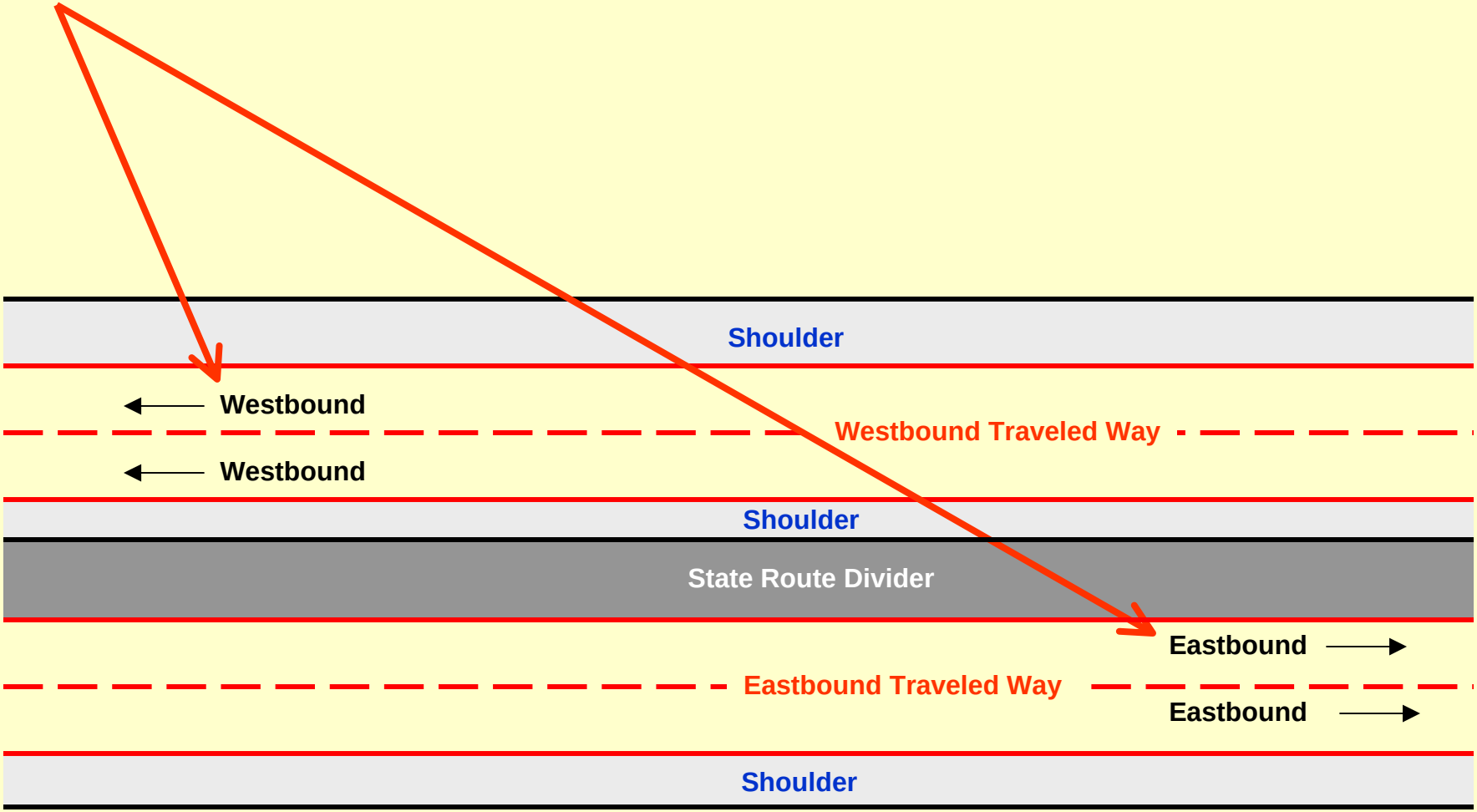
Reference: Adapted from ANSI D16.1-1996

STATE ROUTE TRAVELED WAY: That part of a State Route designed, improved and ordinarily used for vehicle travel. Separate traveled ways will be provided in north/south or east/west combinations.



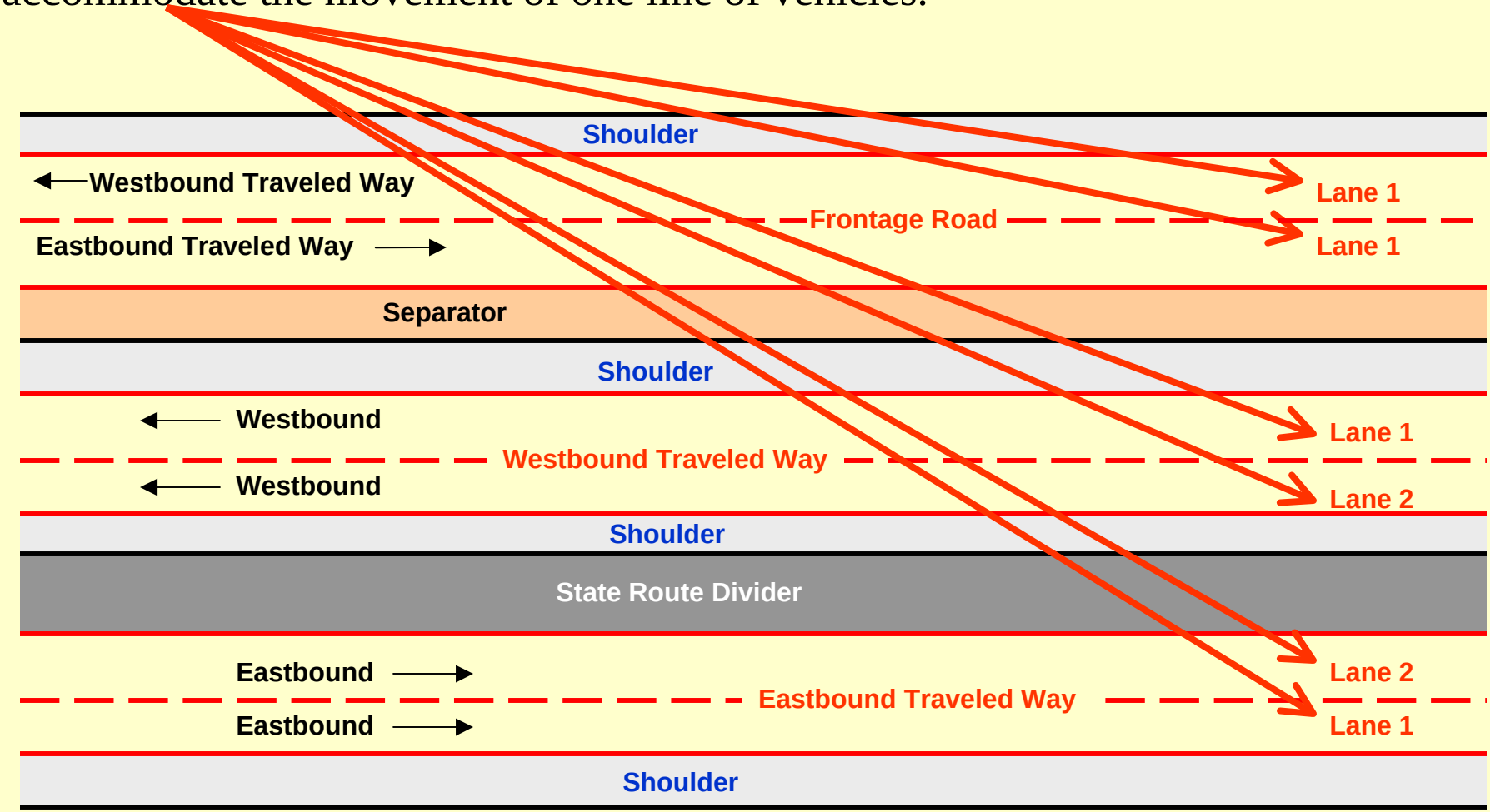
Reference: Adapted from ANSI D16.1-1996

DIRECTON OF TRAVEL: The primary direction, e.g. northbound, southbound, eastbound, westbound, of the State Route Traveled Way.



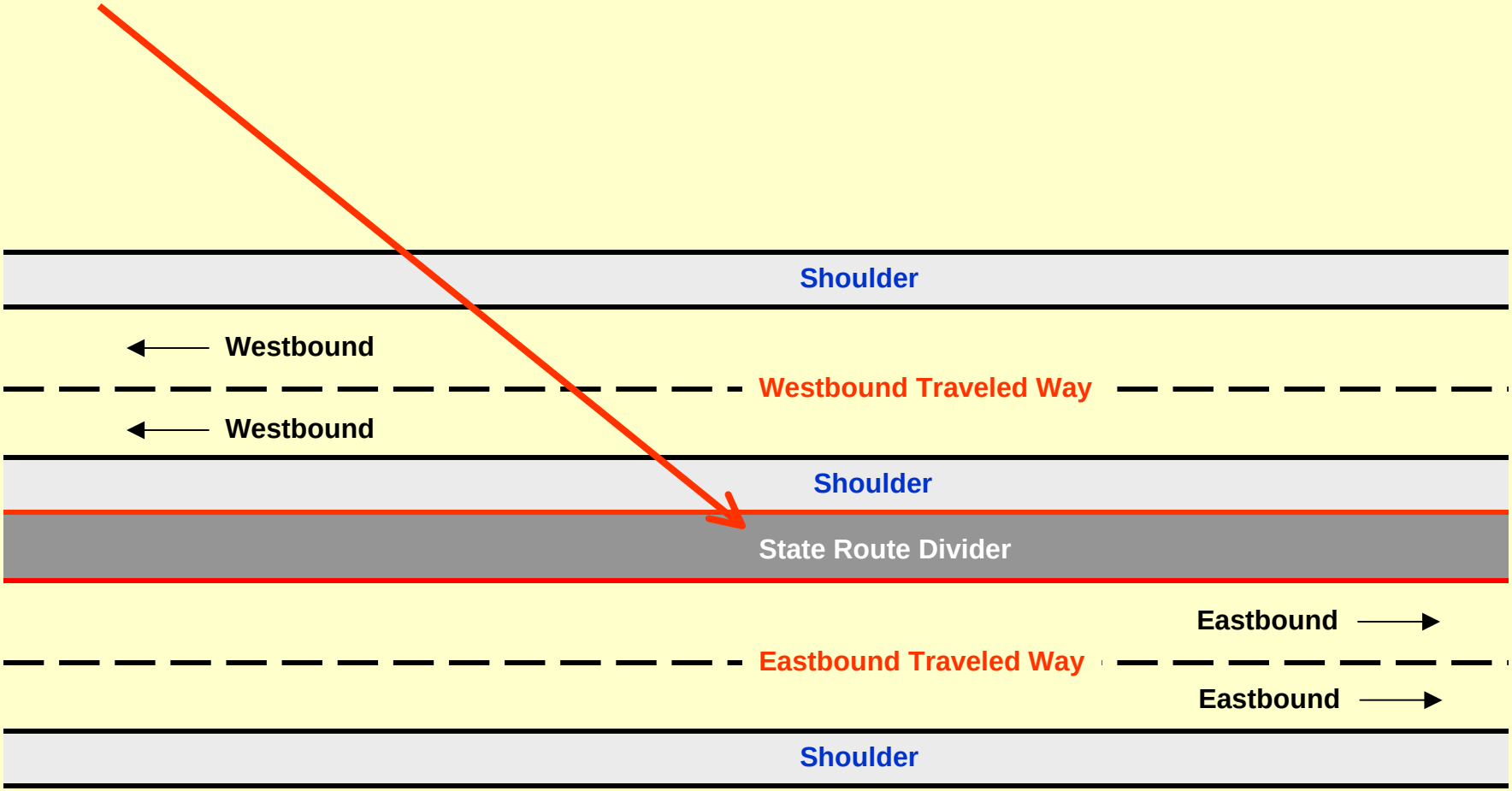
Reference: Core Team Definition

LANE: That area of a traveled way designated by pavement markings or other devices to accommodate the movement of one line of vehicles.



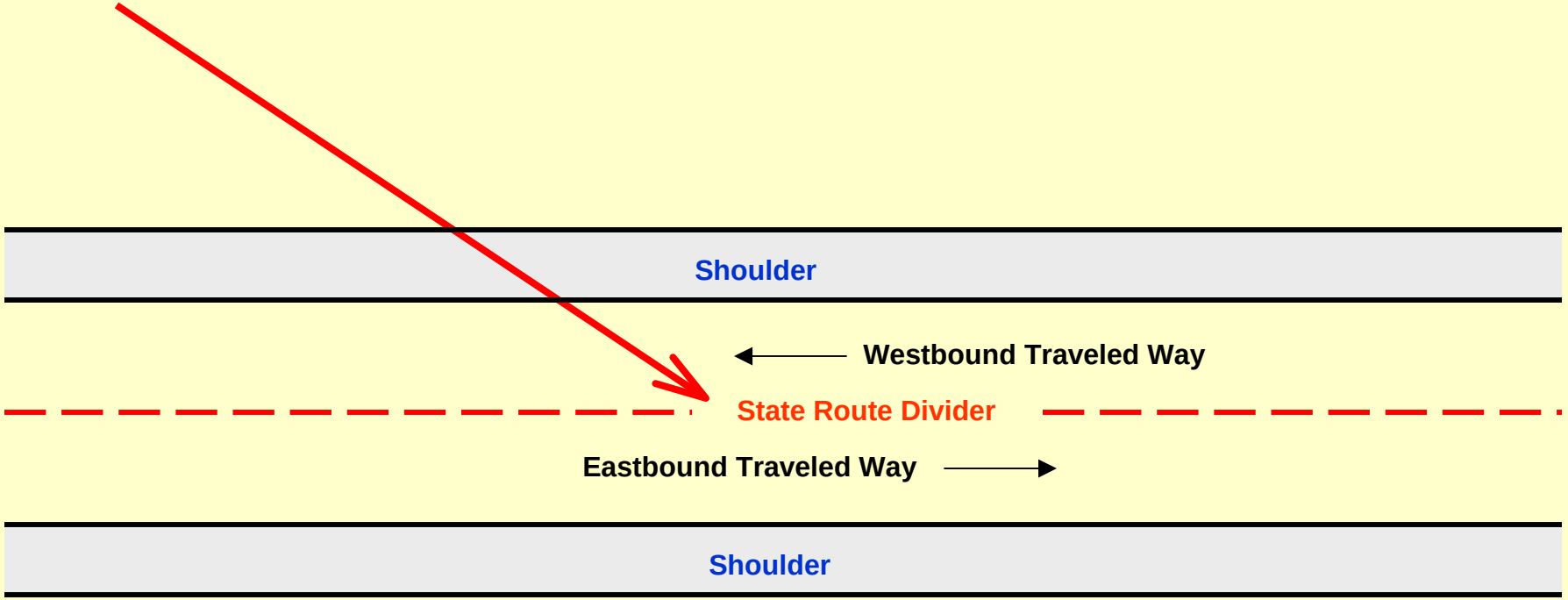
Reference: Webster's Dictionary

STATE ROUTE DIVIDER: One or more components that divide the traveled ways of a State Route.



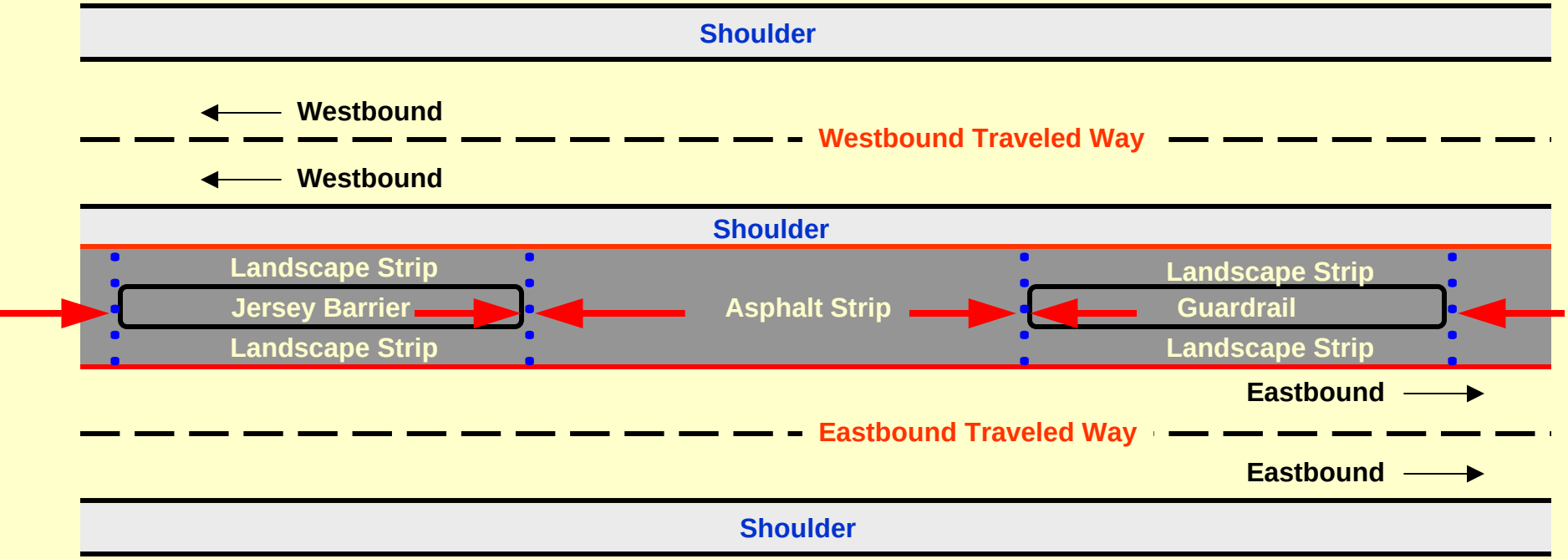
Reference: Core Team Definition

STATE ROUTE DIVIDER: One or more components that divide the traveled ways of a State Route. (This example depicts the state route divider to be a 4 inch paint stripe)



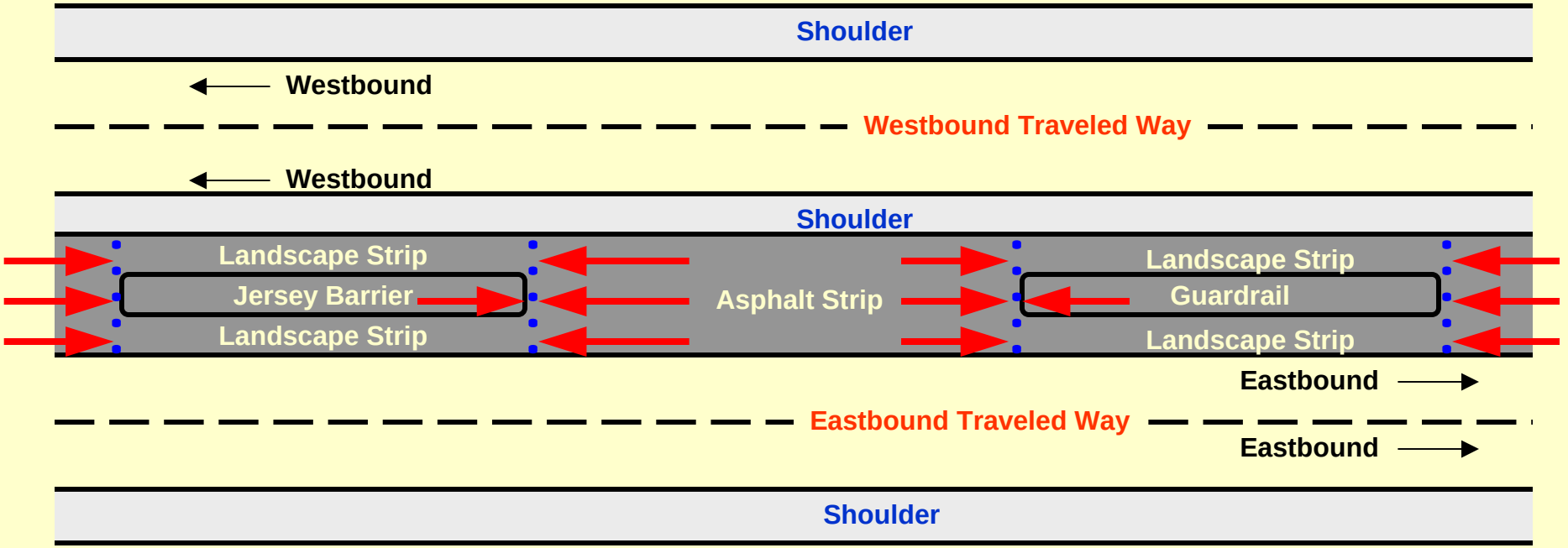
Reference: International Standard Organization (ISO) Concept

DIVIDER SEGMENT: A linear section of a divider.



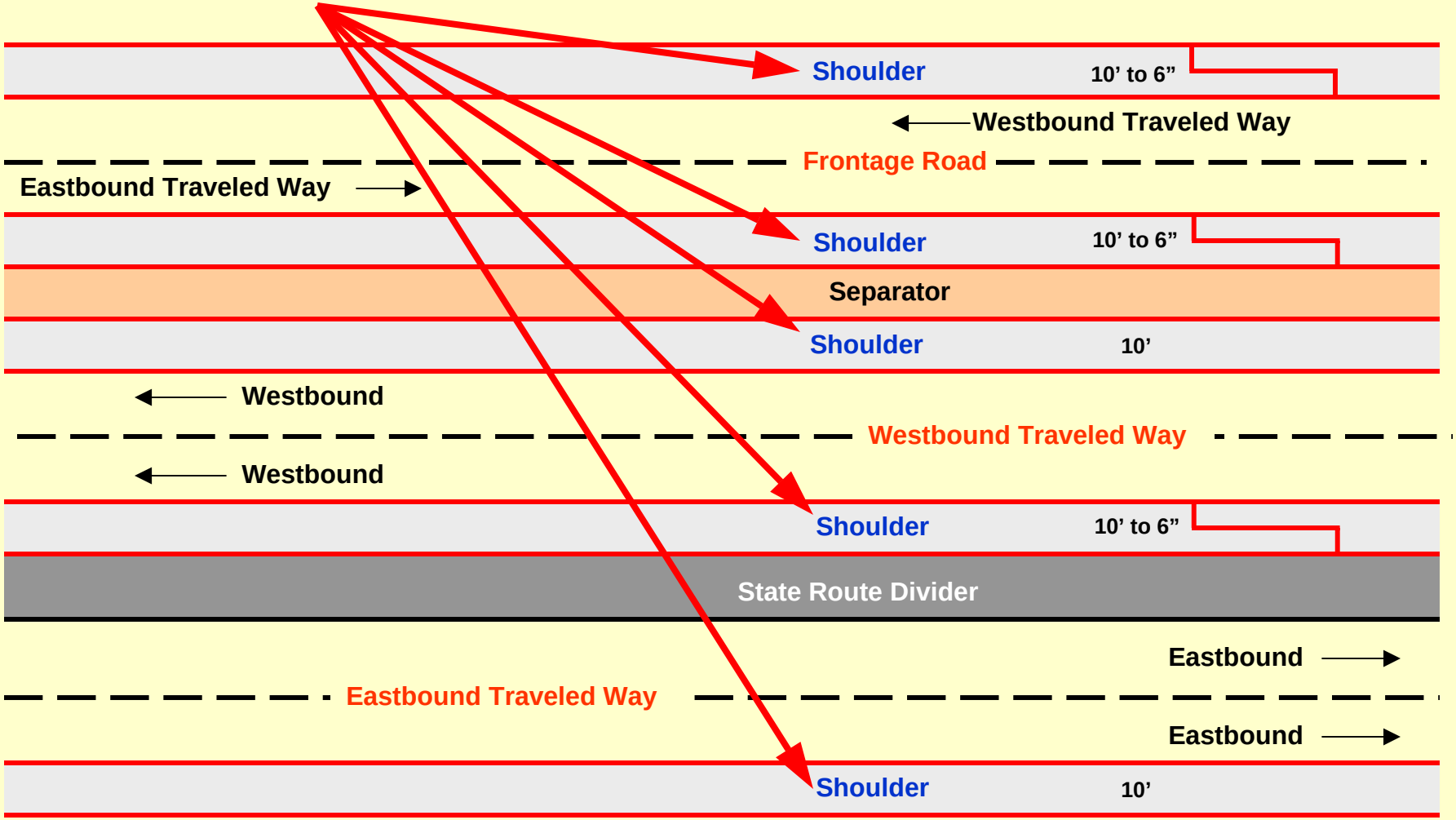
Reference: Core Team Definition

DIVIDER SEGMENT COMPONENT TYPE: Identifies individual pieces of a segment, e.g. paintstripe, guardrail, landscape strip, asphalt strip, jersey barrier.



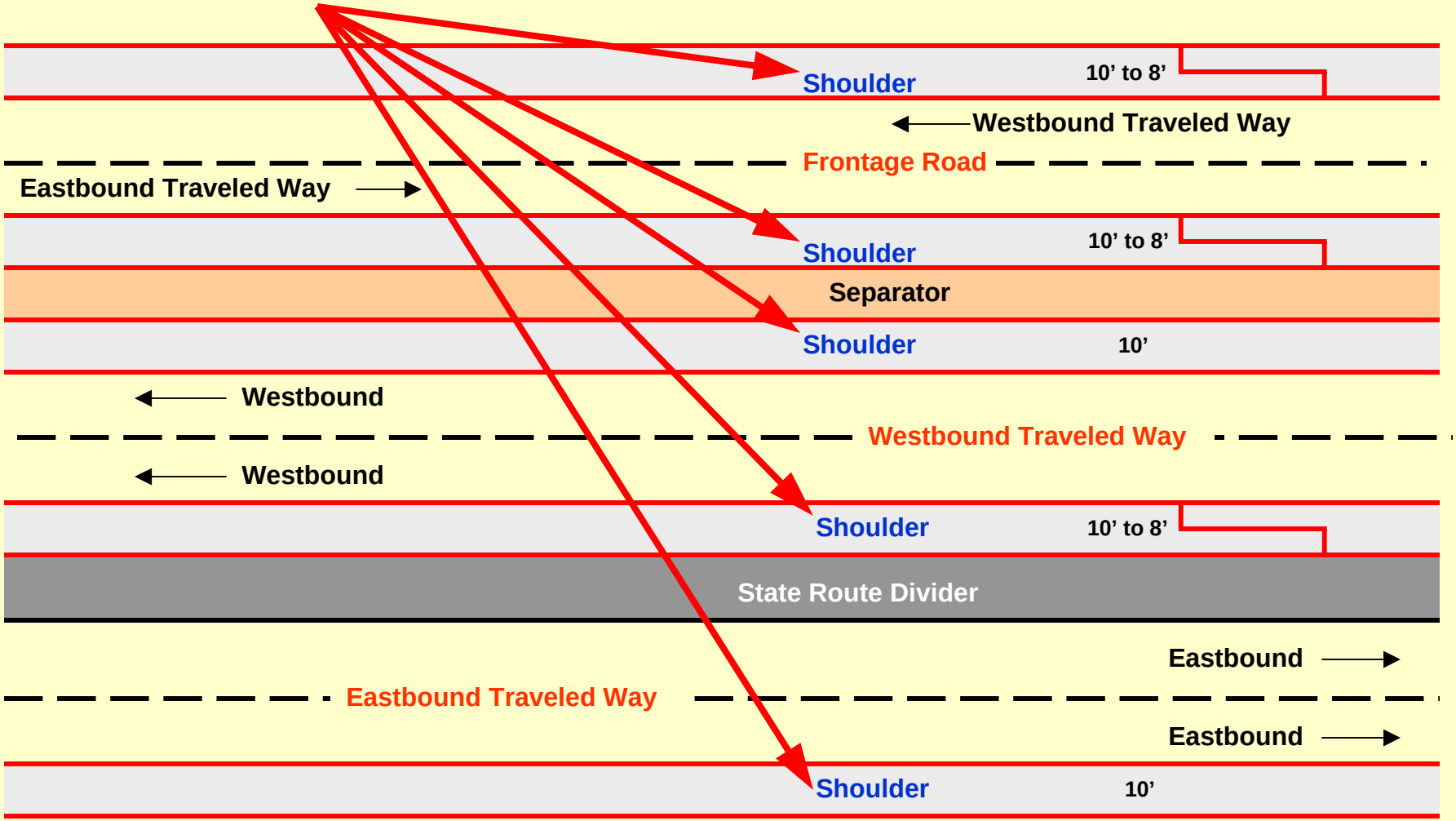
Reference: Core Team Definition

SHOULDER: That portion of the State Route contiguous with the traveled way that provides lateral support of subbase, base and surface courses; and may provide a recovery area for errant vehicles.



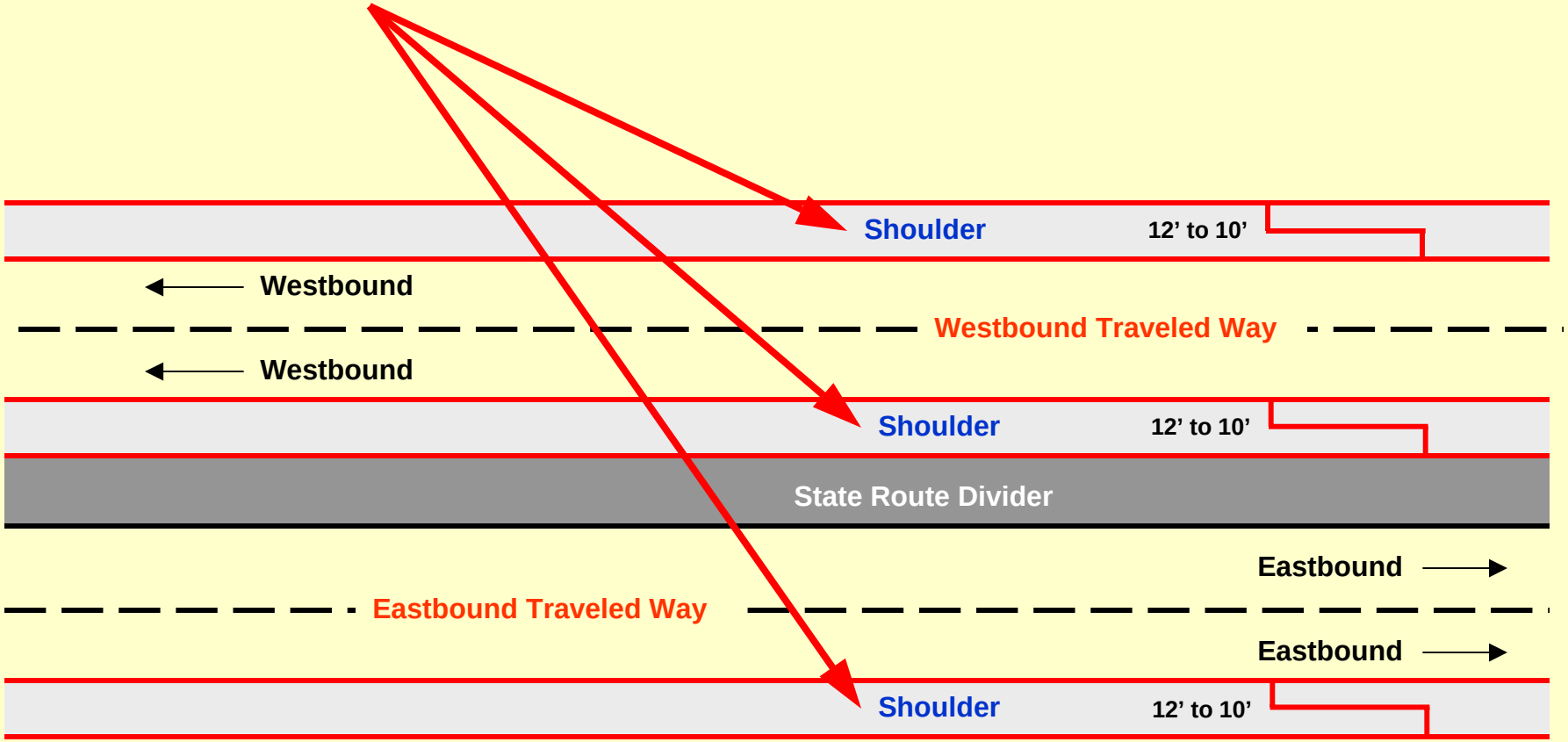
Reference: AASHTO, ANSI D16.1-1996 and Core Team Definition

FULLY ACCESSIBLE SHOULDER: A shoulder that can accommodate vehicles and is accessible for emergency use.



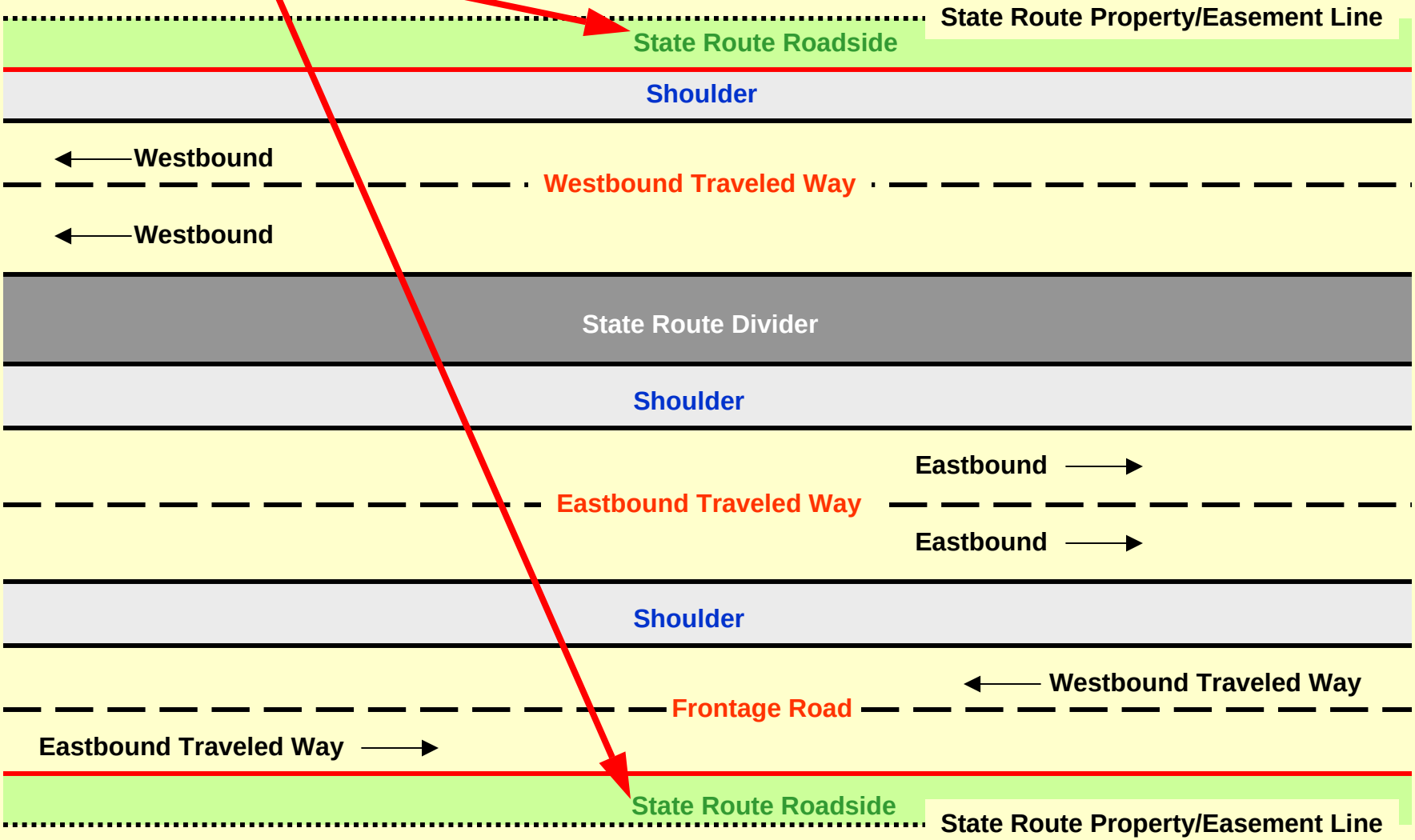
Reference: AASHTO and Core Team Definition

DESIGN ACCESSIBLE SHOULDER: A shoulder that is designed to accommodate vehicles, is accessible for emergency use, and may be incorporated as a Lane in the Traveled Way in the future.



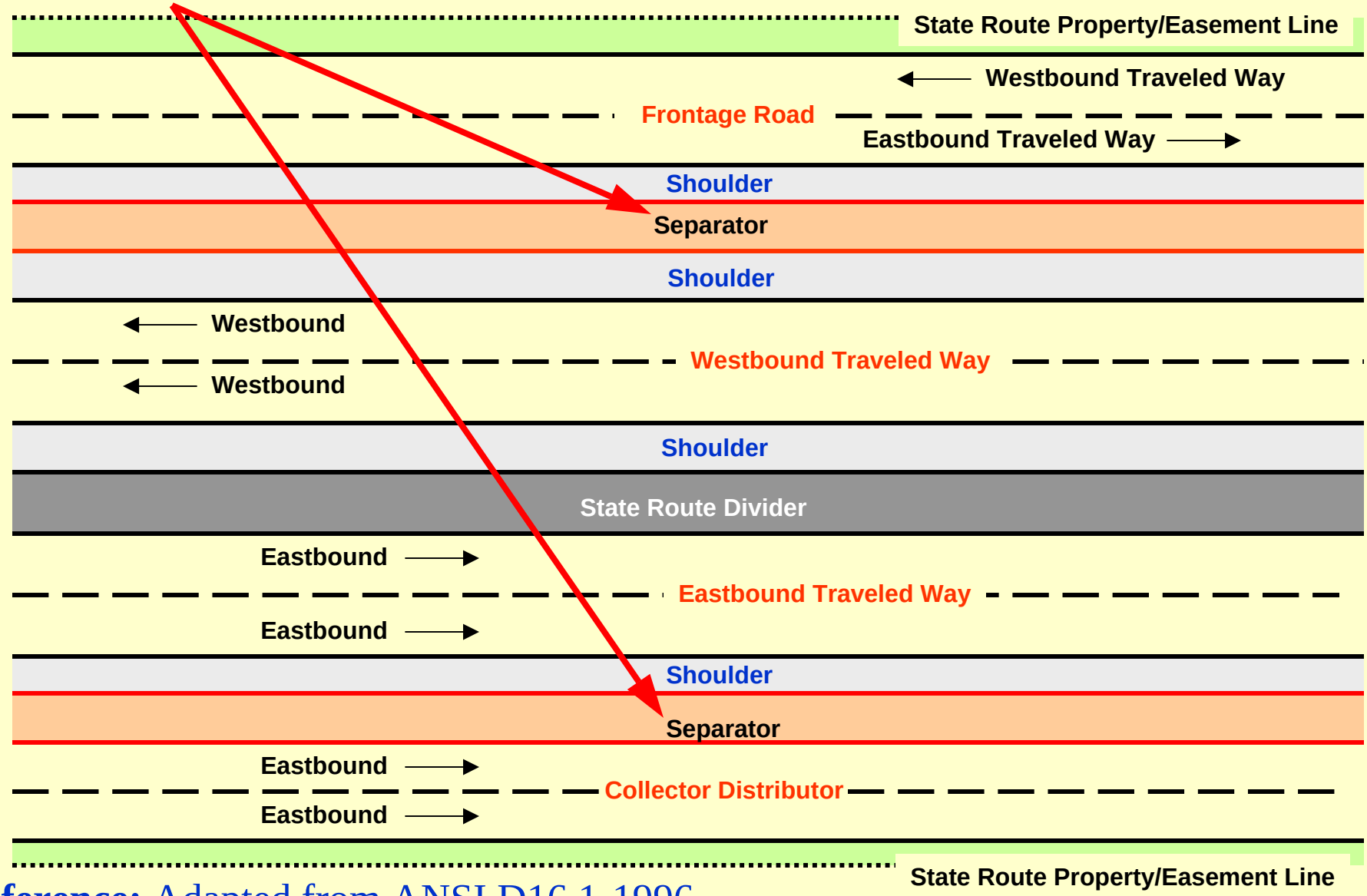
Reference: AASHTO and Core Team Definition

STATE ROUTE ROADSIDE: The outermost part of the State Route from the property line or other boundary into the edge of the traveled way or shoulder, excluding separators.



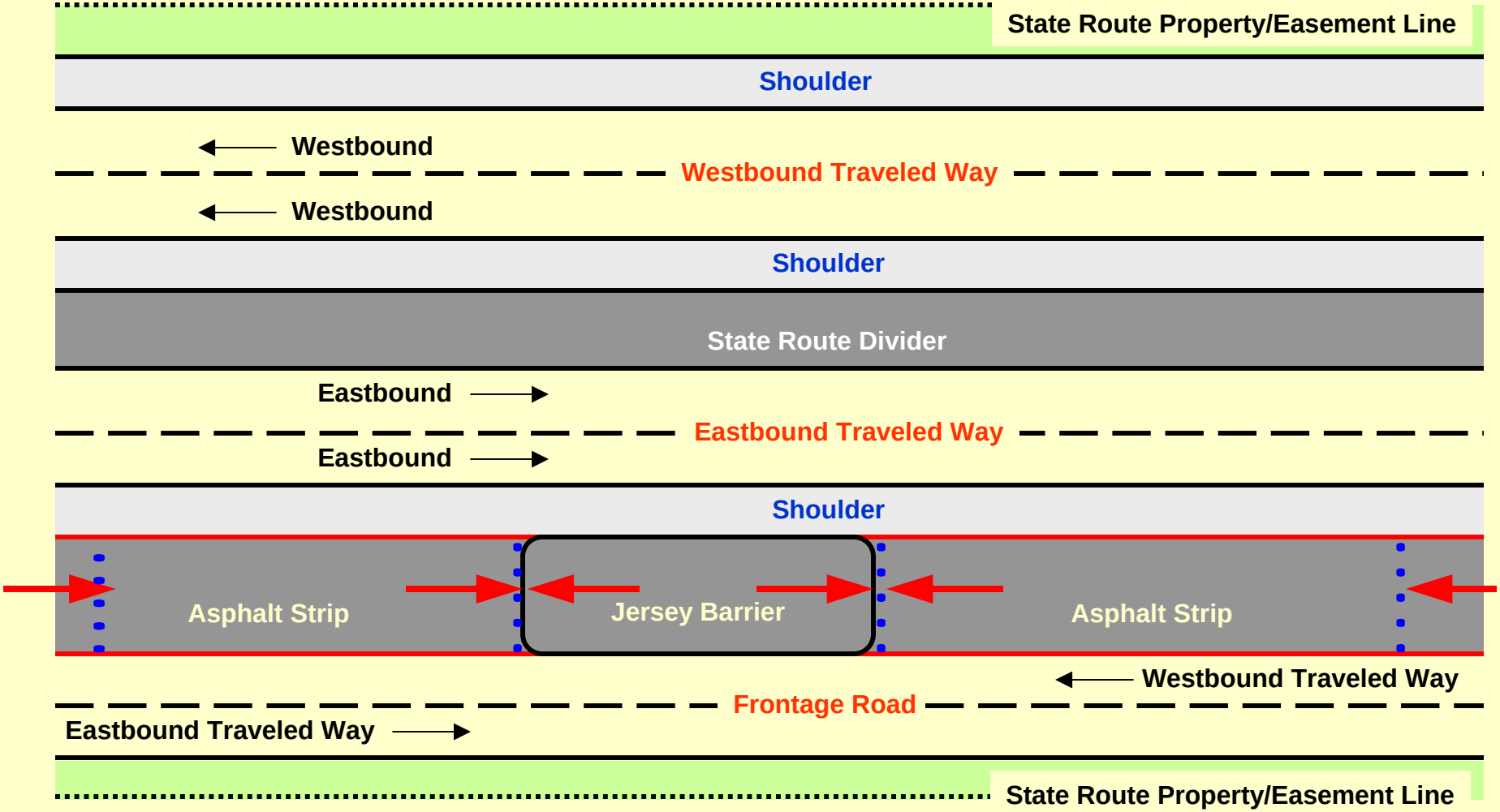
Reference: Adapted from ANSI D16.1-1996

STATE ROUTE TRAVELED WAY SEPARATOR: One or more components between adjacent traveled ways separating travel in the same direction or separating a frontage road from other traveled ways.



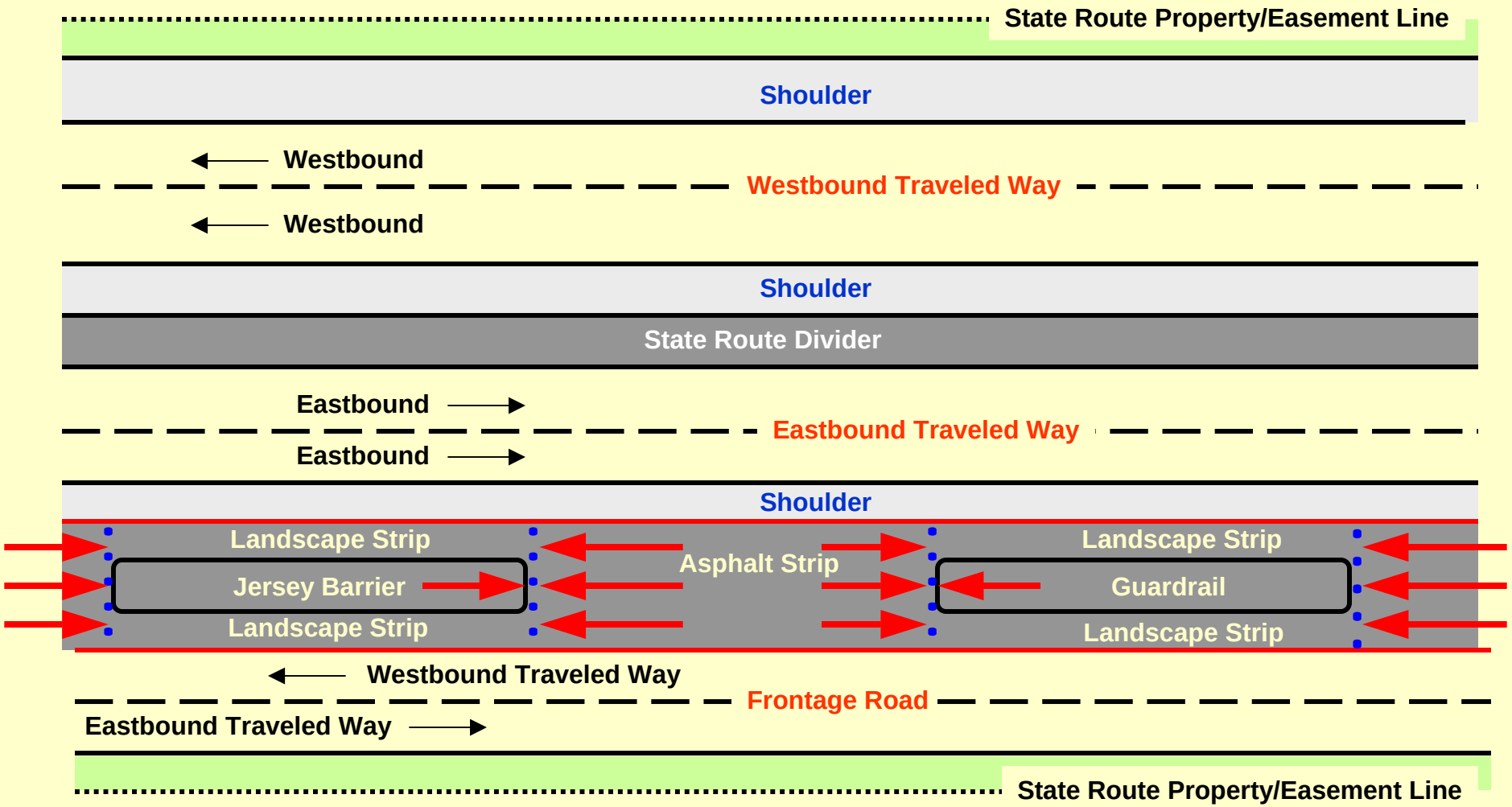
Reference: Adapted from ANSI D16.1-1996

SEPARATOR SEGMENT: A linear section of a separator.



Reference: Core Team Definition

SEPARATOR SEGMENT COMPONENT TYPE: Identifies individual pieces of a segment, e.g. paint stripe, guardrail, landscape strip, asphalt strip, jersey barrier. (Also common to dividers)



Reference: Core Team Definition

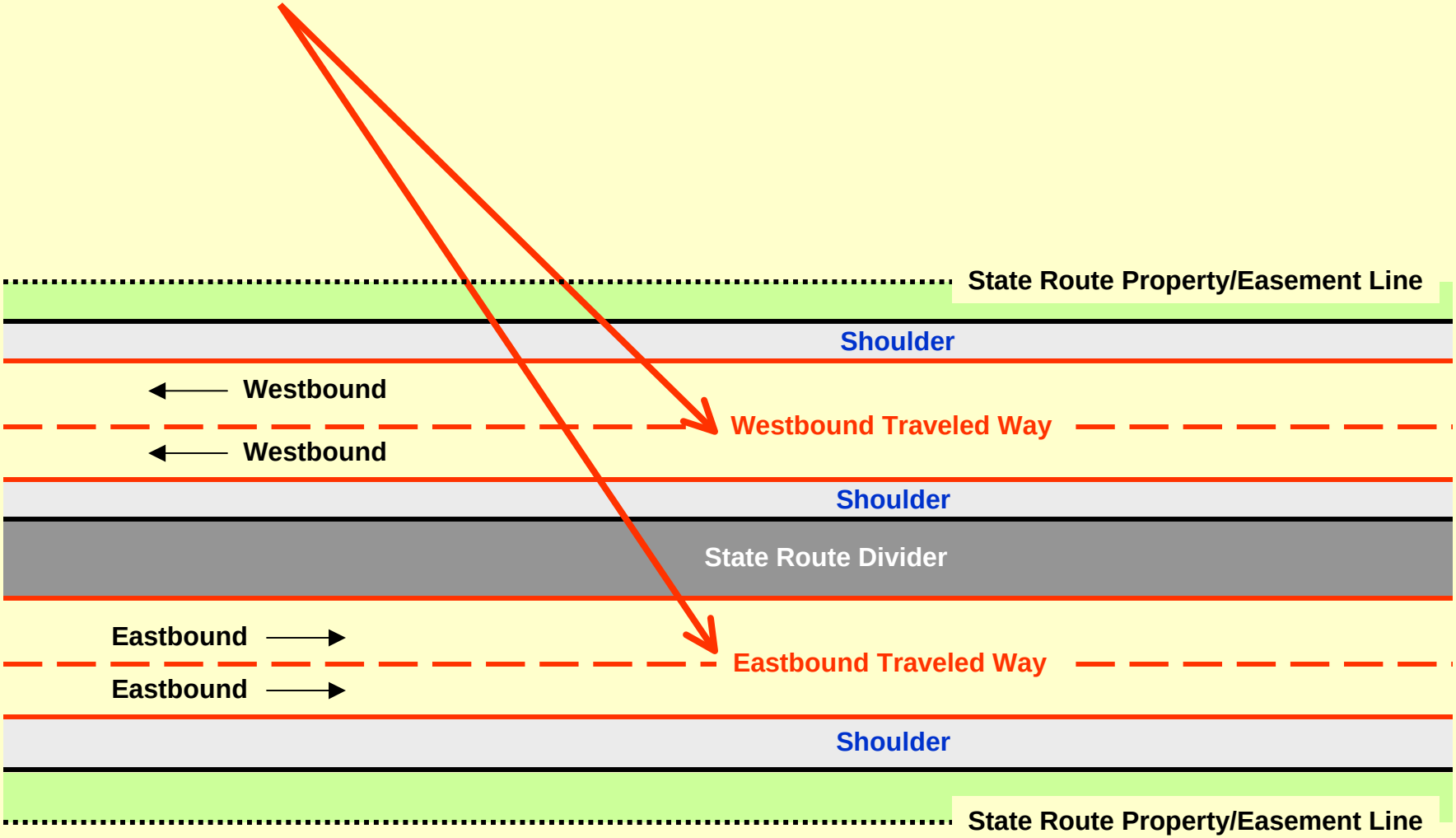
STATE ROUTE BRANCH A trafficway that stems from a State Route under WSDOT jurisdiction for public use as a matter of right or custom for the purpose of moving persons or property from one place to another. State Route Branches include the following:

- Spur
- Alternate
- Temporary
- Separated HOV
- Frontage
- Transitional Turnback

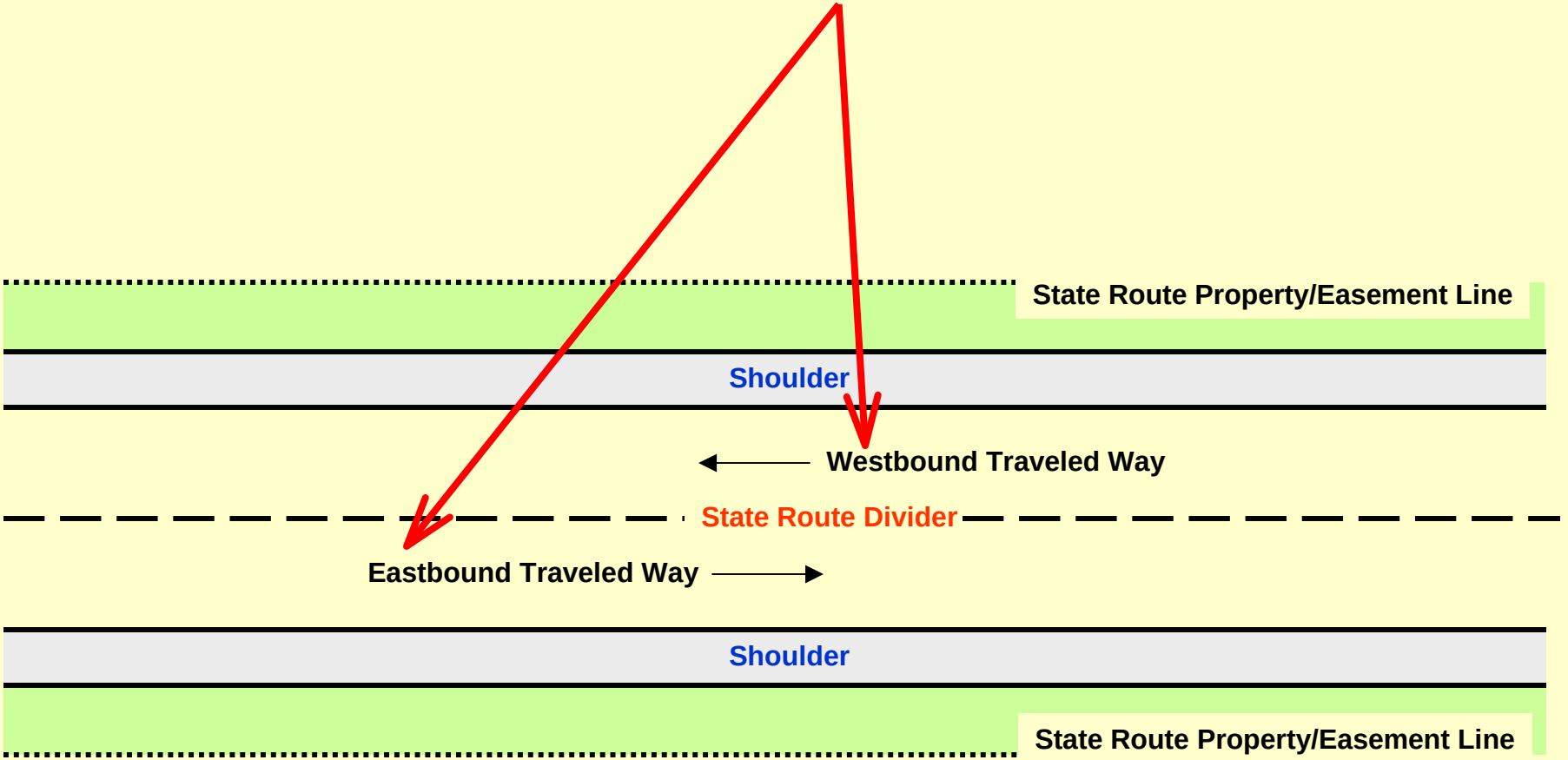
Reference: Core Team Definition

Business Rules

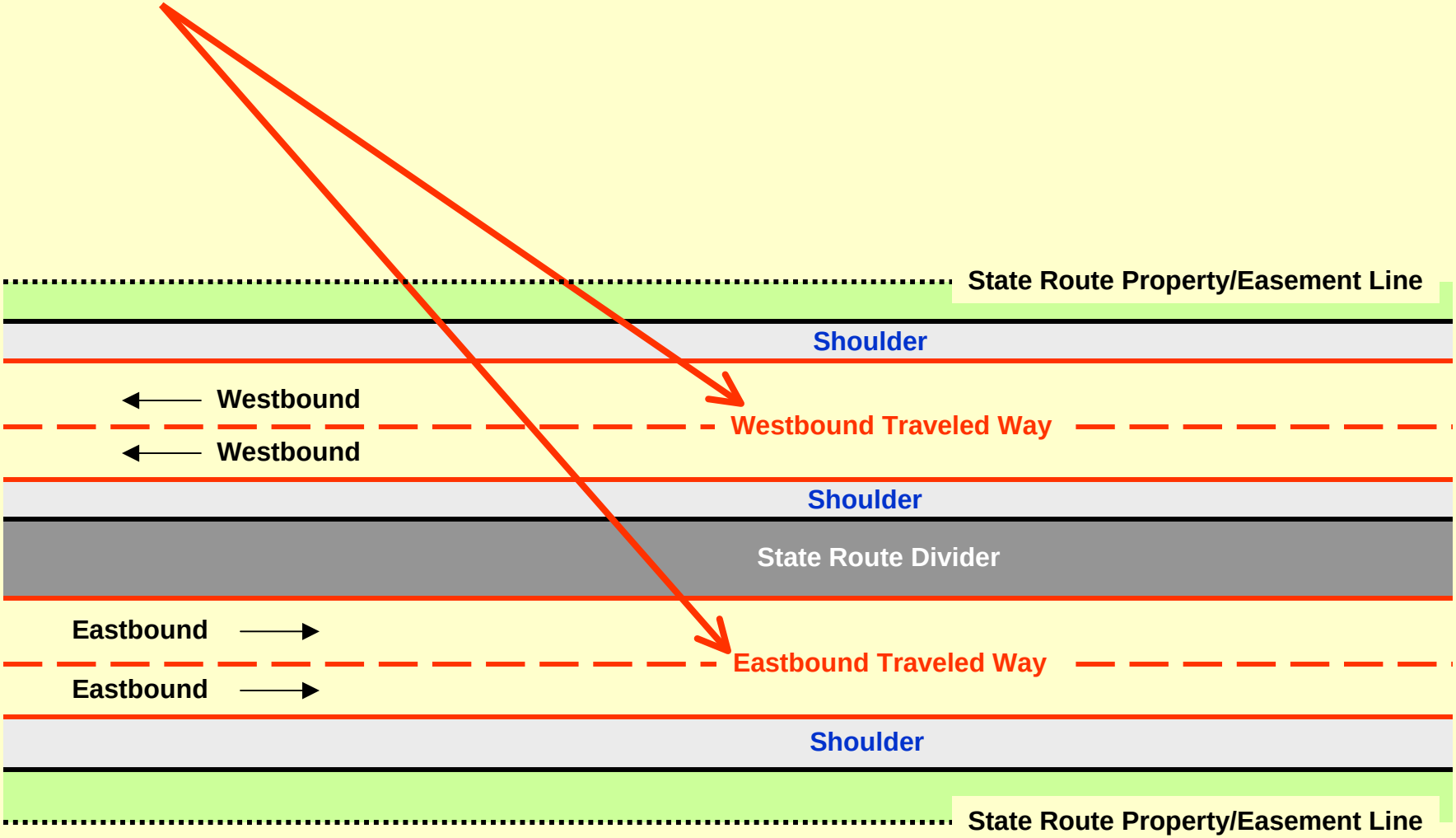
RULE #1, Example A: A State Route must have only 2 traveled ways. Separate traveled ways will be provided in north/south or east/west combinations.



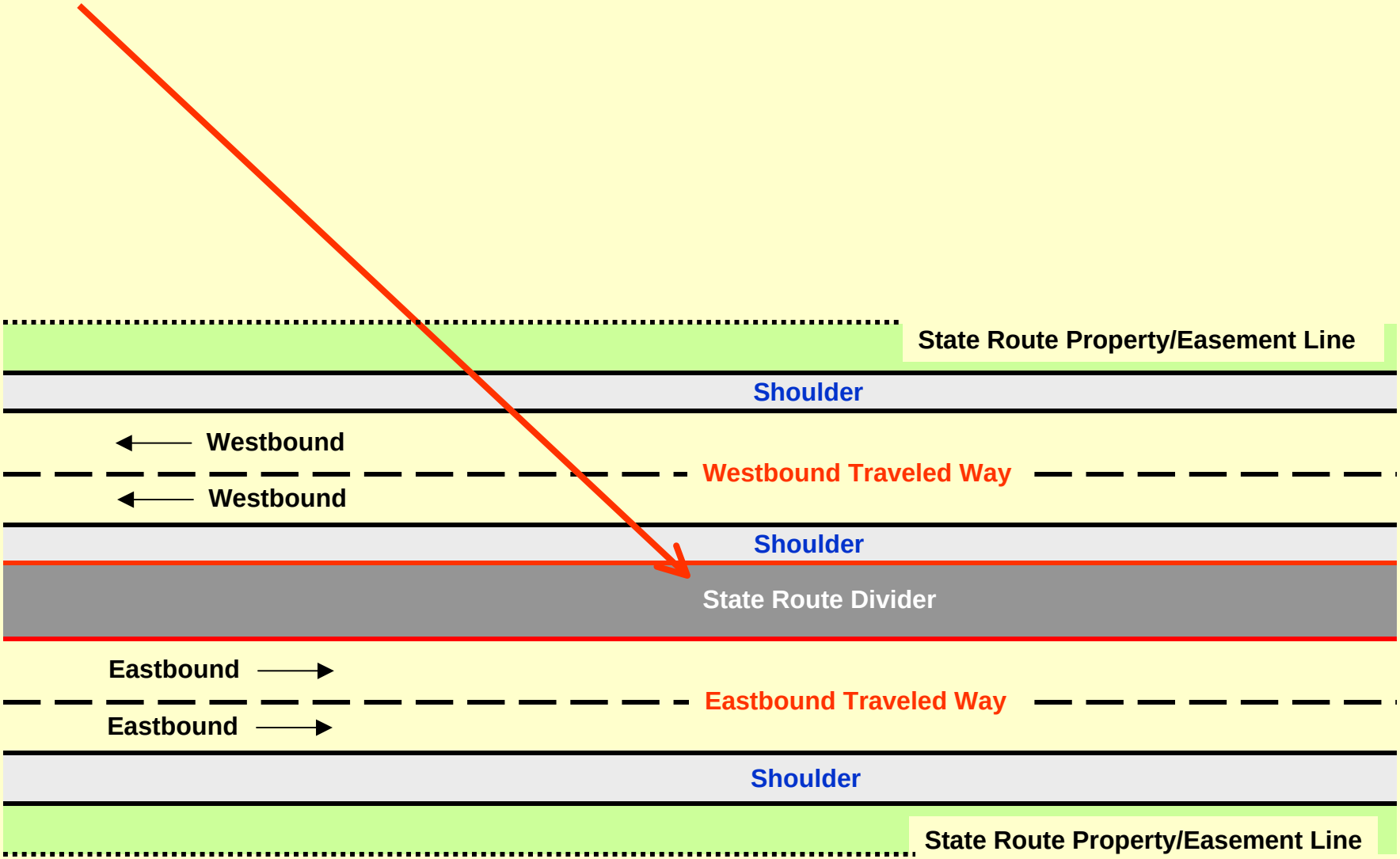
RULE #1, Example B: A State Route must have only 2 traveled ways. Separate traveled ways will be provided in north/south or east/west combinations.



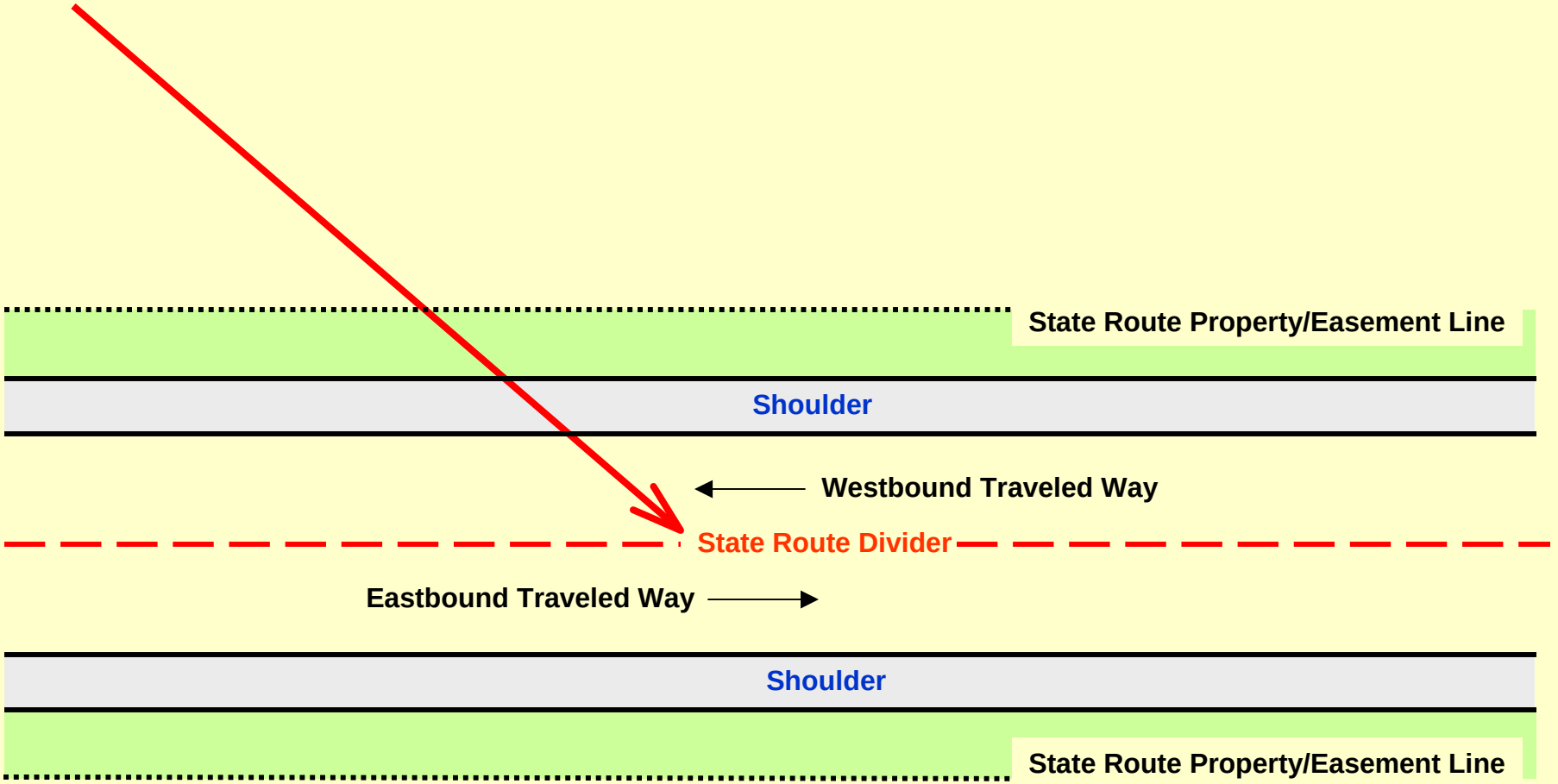
RULE #2: A State Route must have only 2 primary directions of travel in a northbound/southbound or eastbound/westbound combinations.



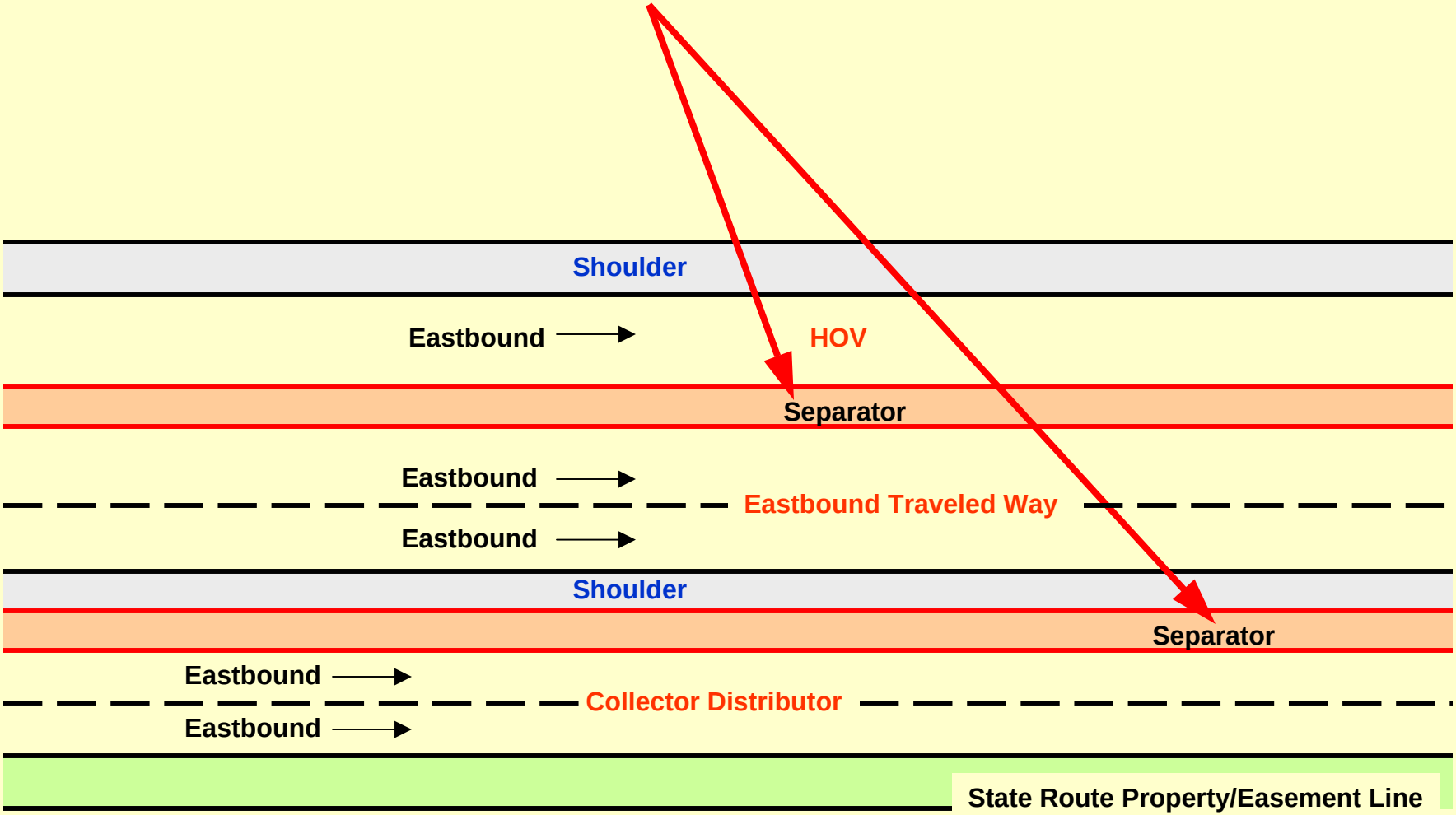
RULE #3, Example A: A State Route must have only 1 divider.



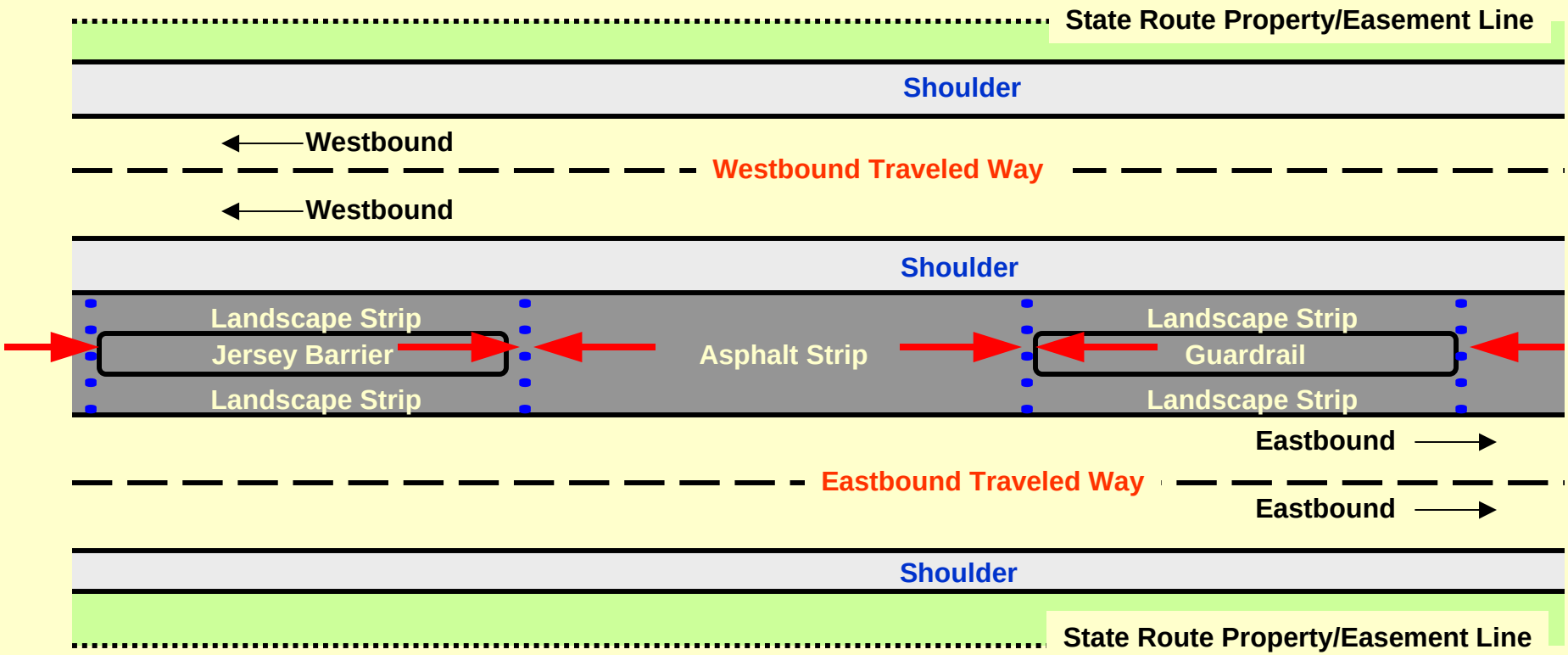
RULE #3, Example B: A State Route must have only 1 divider.



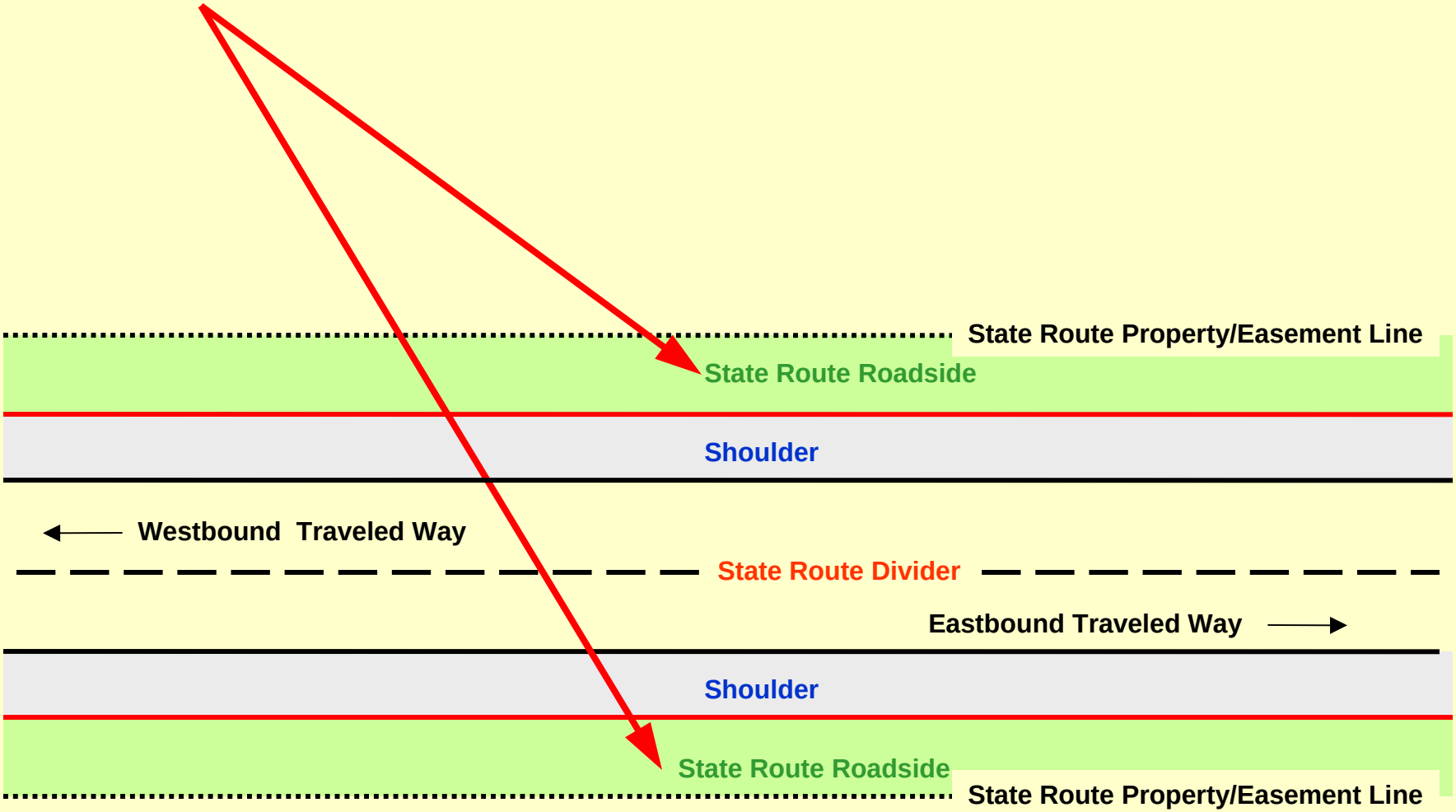
RULE #4: A State Route Traveled Way can never have more than 2 separators;
A State Route can never have more than 4 separators.



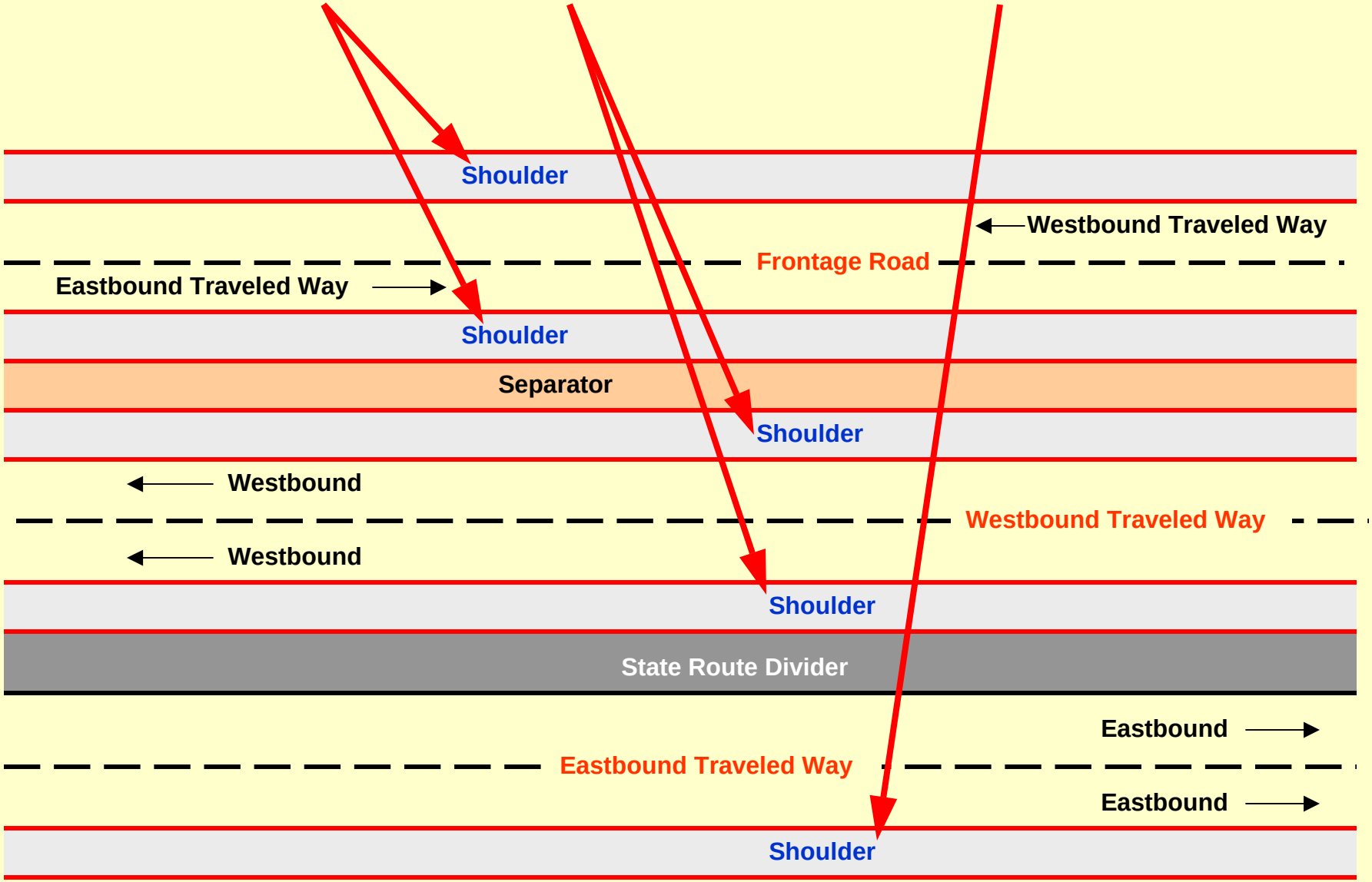
RULE #5: A State Route Traveled Way must have 1 divider segment component that is common to both traveled ways.



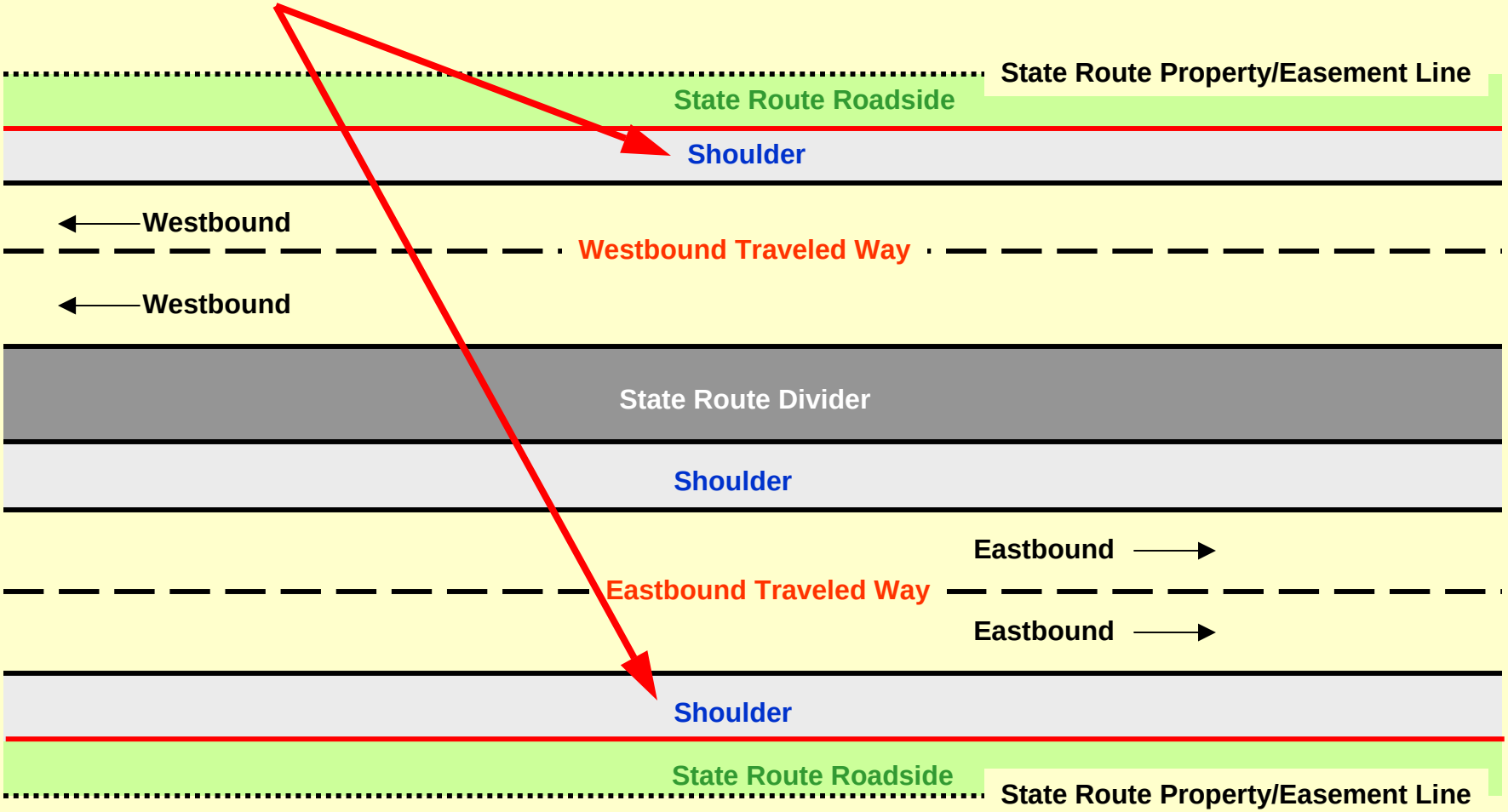
RULE #6: A State Route must have only 2 Roadsides.



RULE #7 : A Traveled Way can never have more than 2 Shoulders.

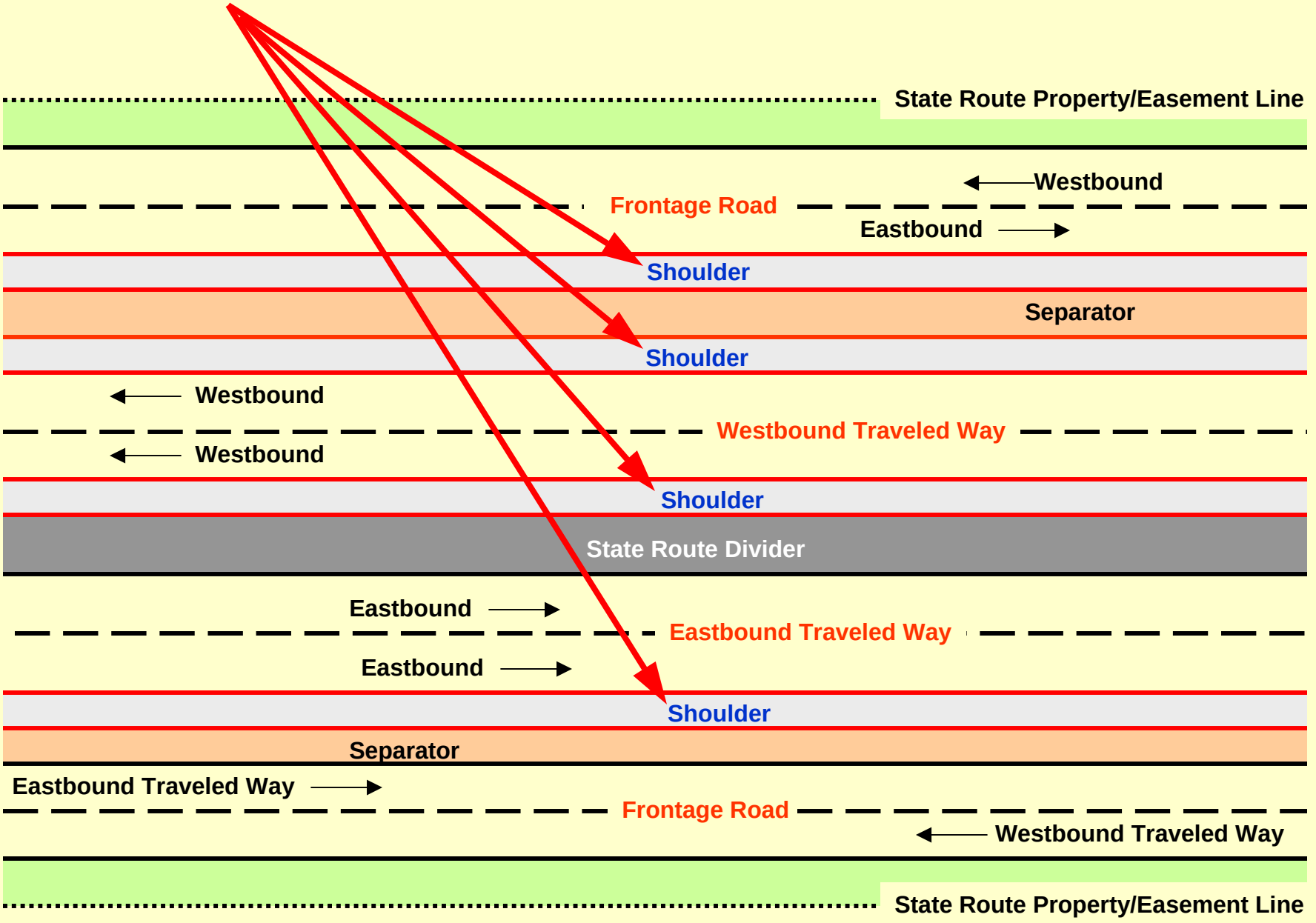


Rule #8: On a State Route designated as Interstate, the outside shoulder must be a minimum of 10’ wide.

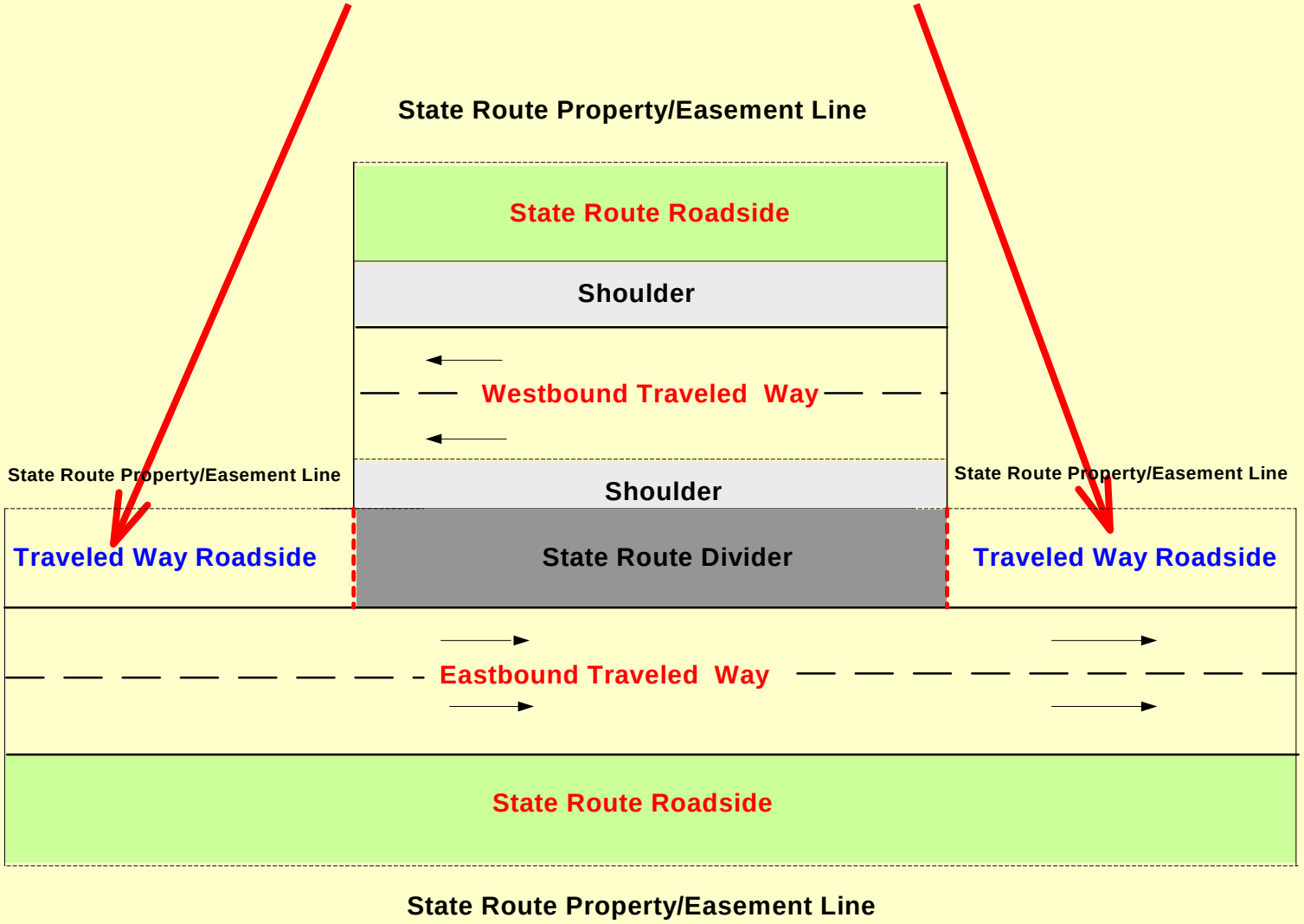


Reference: Adapted from ANSI D16.1-1996

RULE #9: A Shoulder can never be a component of a divider or segment.



RULE #10: A Traveled Way can never have more than 2 Traveled Way Roadsides. This example depicts a state route with one traveled way longer than the other.



Reference: Core Team Definition

Please Note!

“This will have an impact on systems that interface with current TRIPS”

Change Is Good!

A New LRS will facilitate
Corporate Asset Management

Timeline

- Goal is to complete a Corporate State Route Model within 2 Years
- Regional & Headquarter introductory meetings are scheduled as follows:

Olympic Region: Sept. 18, 1:30-4:00P (Conference Room)

Eastern Region: Sept. 24, 1:30-4:00P (Large Conference Room)

South Central Region: Sept. 25, 1:00-3:30P (East Selah Conf. Room)

North Central Region: Sept. 26, 8:30-11:00A (Conference Room)

Southwest Region: Oct. 29, 9:00-11:00A (Conference Room 211)

Northwest Region: Oct. 2, 1:00-3:30P (Dayton 2A Conf. Room)

Headquarters: Nov. 14, 1:30-4:00P (Mt. Rainer Conference Room)

What we need from you…….

- Sharing – Discuss these new concepts among your business groups.
- Feedback – Does this support your business needs? If not, then what changes are needed to support your business requirements?

Contact Information

Please send your feedback to:

Mark Finch
Roadway Systems Branch Manager
Transportation Data Office
E. 318 State Ave. NE 98504-7380
Voice (360) 570-2369
Fax: (360) 570-2400

Randy Rogers
Information Architect
Office of Information Technology
809 Legion Way SE, MS 47430
Voice (360) 705-7688
Fax: (360) 705-6927

PowerPoint presentation is available at:
http://wwwi.wsdot.wa.gov/ppsc/tdo/srmethodology.htm